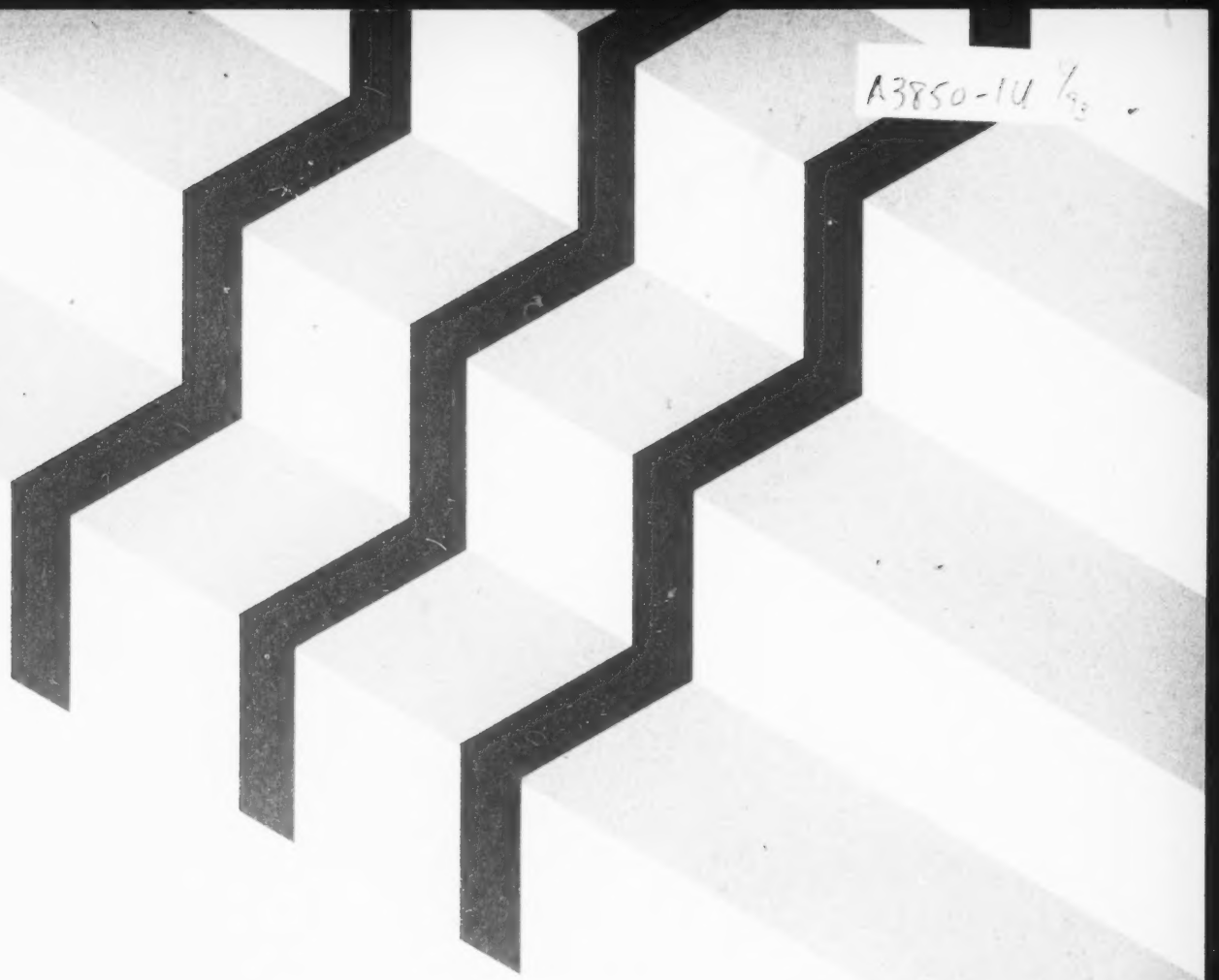
A3850-14 1/93

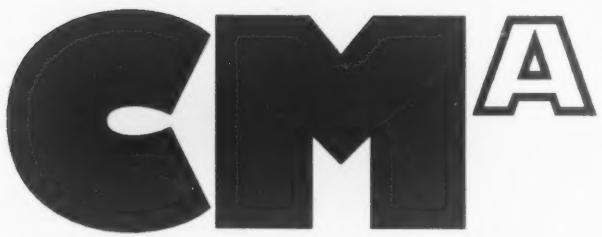
U.S. CHEMICAL INDUSTRY STATISTICAL HANDBOOK



CMA
CHEMICAL MANUFACTURERS ASSOCIATION

U.S. Chemical Industry Statistical Handbook

1993



CHEMICAL MANUFACTURERS ASSOCIATION
2501 M Street, NW
Washington, D.C. 20037
(202) 887-1100
© 1993 Chemical Manufacturers Association, Inc.

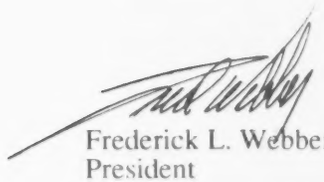
Introduction

September, 1993

This is the fourth edition of the Chemical Manufacturers Association's "U.S. Chemical Industry Statistical Handbook". The objective of this publication, which is updated annually, is to provide an economic profile of the U.S. chemical industry and a comprehensive source of economic and other data about the industry.

We want this Handbook to meet industry and public needs. Suggestions for improvement will be welcomed.

The Chemical Manufacturers Association (CMA) is a nonprofit trade association whose member companies account for more than 90 percent of the basic industrial chemical productive capacity in the United States. Founded in 1872, CMA is the oldest manufacturing trade association in the Western Hemisphere.



Frederick L. Webber
President

Technical Notes and Acknowledgements

Unless otherwise noted, all statistical data are drawn from official U.S. government sources.

Data sources are noted at the bottom of each table. Lack of space precludes inclusion in this publication of all notes concerning methods and sources which were included in the original statistical sources. For required detail users may find it necessary to consult the original source.

Many time series go through several revisions. Thus, data for recent years may be preliminary and subject to later revisions.

The abbreviation n/a indicates that data was not available at the time of preparation of the series concerned.

The sum of individual data points within a table or graph may not add to the totals indicated, due to independent rounding.

CEFIC is the acronym for the "Conseil Europe'en des Federations de Industrie Chimique", the European chemical industry association, a data source utilized in this publication.

"World Manufactures Trade Data Base" is a data base created at CMA to allow assessments of world manufactures trade flows.

Every effort has been made in the preparation of this publication to provide the best available information. However, CMA cannot be responsible for the accuracy of individual statistics.

This publication was prepared by the Trade and Economics Division of the Federal Government Relations Department of CMA. The cooperation of many contacts in government and other organizations is gratefully acknowledged.

Allen J. Lenz (202) 887-1132
Director, Trade and Economics

T. Kevin Swift (202) 887-1286
Senior Economist

Keith A. Christman (202) 887-1396
Economist

Scott Ellsworth (202) 887-6948
Industry Analyst

Kristin L. Greenwald (202) 887-1129
Staff Assistant

Julie A. Davis (202) 887-1133
Administrative Assistant

Table of Contents
U.S. Chemical Industry Statistical Handbook

		PAGE
	TECHNICAL NOTES AND ACKNOWLEDGMENTS	
	CMA INITIATIVES	1
	WHAT IS THE CHEMICAL INDUSTRY?	7
1	SUMMARY OF INDUSTRY PERFORMANCE	21
2	PRODUCTION, PRICES, AND FINANCIAL DATA	23
	Industrial Production	27
	GDP by Industry	27
	Capacity Utilization	27
	Industry Shipments	29
	Inventories	31
	Price Indexes	31
	Revenues and Income	33
	Assets	33
	Financial Ratios	34
	Inorganic Chemicals Production	35
	Organic Chemicals Production	36
	Top 50 Chemicals	38
3	U.S. INTERNATIONAL TRADE	39
	Summary of Chemicals Trade	41
	Chemicals Trade by Product and by Country	47
	Volume, Prices, and Terms of Trade	85
	U.S. Companies and International Trade	86
	Company Concentration: Sales and Exports	86
4	INVESTMENT IN RESEARCH AND DEVELOPMENT	87
	R&D Funding	89
	Scientists & Engineers	89
	Patents Granted	90
5	INVESTMENT IN PLANT AND EQUIPMENT	91
	New Plant and Equipment Expenditures	93
	Gross Investment	93
	Capital Stocks and Capital Productivity	95
	International Direct Investment	97
6	EMPLOYMENT AND LABOR	99
	Employment	101
	Production Employment	101
	Wages	103
	Average Weekly Hours	105
	Labor Productivity and Unit Costs	106
7	HEALTH, SAFETY, AND THE ENVIRONMENT	107
	Health, Safety and Environmental Legislation	109
	Key Administrators of Environmental, Health & Safety Regulations	111
	Cost of Regulations	114
	Indicators of Environmental Progress	118
	Toxic-Release Inventory "33-50"	130
	Pollution Abatement Expenditures	133
	Risks vs. Cost-Effectiveness	137
	Incidence of Injury and Illness	139

Table of Contents
U.S. Chemical Industry Statistical Handbook

		PAGE
8	ENERGY	141
	Energy Consumption	143
	Feedstock Consumption	144
	Electric Power Use	144
	Energy Input Prices	145
9	STATE CHEMICAL INDUSTRIES	147
10	DISTRIBUTION	151
11	WORLD CHEMICAL INDUSTRIES AND TRADE	155
	Chemical Industries of Selected Countries	158
	World Chemical Imports and Exports	167
	DEFINITION OF THE CHEMICAL INDUSTRY	179

CMA INITIATIVES

Responsible Care®

CHEMSTAR

Chemtrec®

RESPONSIBLE CARE®
THE PUBLIC COMMITMENT

Through the Chemical Manufacturers Association (CMA) Responsible Care® initiative, member companies have pledged to achieve continuous environmental, health and safety performance improvement. It is the goal of Responsible Care® to achieve this performance improvement in a manner that provides for public involvement. Satisfying these two fundamental objectives is an obligation of participation in CMA.

Responsible Care® covers the entire life cycle of the chemical process, including down stream users of chemicals and products made with chemicals. Since CMA's members account for 90% of the productive capacity for industrial chemicals in the United States, virtually every American benefits by the achievements accomplished through Responsible Care®.

Responsible Care® consists of several important features, including: Guiding Principles; Codes of Management Practices; a National Public Advisory Panel; an Evaluation process; Member Mutual Assistance; and a Partnership Program with allied industries.

The vision of CMA's Responsible Care® initiative is articulated through the 10 Guiding Principles. These Guiding Principle are:

- To recognize and respond to community concerns about chemicals and our operations.
- To develop and produce chemicals that can be manufactured, transport, used, and disposed of safely.
- To make health, safety and environmental considerations a priority in our planning for all existing and new products and processes.
- To report promptly to officials, employees, customers and the public, information on chemical-related health or environmental hazards and to recommend protective measures.
- To counsel customers on the safe use, transportation, and disposal of chemical products.
- To operate our plant and facilities in a manner that protects the environment and the health and safety of our employees and the public.
- To exend knowledge by conducting or supporting research on the health, safety and environmental effects of our products, processes, and waste materials.
- To work with others to resolve problems created by past handling and disposal of hazardous substances.
- To participate with government and others in creating responsible laws, regulations, and standards to safeguard the community, workplace and environment.
- To promote the principles and practices of Responsible Care® by sharing experiences and offering assistance to others who produce, handle, use, transport, or dispose of chemicals.

Codes of Management Practices - Responsible Care® codes are performance objectives that encourage commitment, innovation and continual improvement. They are at the heart of the initiative, going far beyond the requirements of current law. Codes on Community Awareness and Emergency Response, Pollution Prevention, Process Safety, Distribution, Product Stewardship and Employee Health and Safety are being implemented. The goal of Responsible Care® is long-term significant improvement in the industry's environmental, health and safety performance.

Public Involvement - Through the National Public Advisory Panel, and an extensive national effort to enhance public dialogue, Americans are directly involved in helping to shape the Responsible Care® initiative. Responsible Care® is now embedded in the management process of CMA, directly affecting its decisions about policy, positions and programs. The National Public Advisory Panel acts as a sounding board for public concerns and is made up of a cross section of environmental, health and safety thought leaders. Panel members have been directly involved in shaping Responsible Care®, and continue to provide valuable input into CMA's efforts to continue to enhance the industry's performance and the credibility of the overall initiative. CMA members have formed over 215 local Community Advisory Panels around chemical production facilities. These local panels provide direct input to plant management on the interests of their neighbors. This dialogue with the public is important to the success of Responsible Care®.

Performance Measures - Effective performance evaluation is a critical element of Responsible Care®. Each Code of Management Practices has an evaluation procedure. CMA members report annually to the association on the progress they are making in implementing the Management Practices. The results are promising. For those Codes where CMA has collected multiple year evaluations, Responsible Care® is making an impact of performance.

In the area of Community Awareness and Emergency Response, there has been a 9.1% performance improvement, in Distribution 13.5%, in Pollution Prevention 15.2%, and in Process Safety 10.9%.

CHEMSTAR

The Chemical Self-Funded Technical Advocacy and Research CHEMSTAR Panels and Business Councils provide ways for companies and other associations to affiliate on a self-supporting basis. Panel and Council members pursue research, communication, education, advocacy, evaluation and litigation activities in chemical specific, business sector, or business function areas that are significant to chemical manufacturing interests.

Although research is still the major activities of most Panels, these CHEMSTAR Panels and Councils work to educate their members, workers, chemical industry executives, safety personnel, government officials, and the public. In addition, various types of communication activities are gaining in importance as are more evaluation-focused efforts.

CHEMSTAR includes six Business Councils — American Plastics, Atmospheric Research, Carrier Assessment, Chemical Distributors, Chlorine Coordinating, and Total Quality — that address research data-gathering, program and advocacy activities in these designated business sector or business function areas.

CHEMSTAR includes approximately 60 Panels — Acetone, Alkanolamines, Alkyphenols & Ethoxylates, Aryl Phosphates, Benzene, Biocides, Brominated Flame Retardants, Butadiene, Butylated Hydroxytoluene, Carbon Disulfide, Chlorinated Pool Chemicals, Chlorine Dioxide, Chlorobenzenes, Cobalt, Cresols, Crystalline Silica, Cumene, Cyclohexane, Dibenzofurans/Dioxins, Diisocyanates, Dinitrotoluenes, Ethylene Dibromide, Ethylene Dichloride, Ethylene Gylcol, Ethylene Oxide, Fluoroalkenes, Gycol Ethers, Hexamethylene Diisocyanate, Hydrazine, Hydrogen Fluoride, Hydroquinone/Quinone, Isopropanol, Ketones, Laboratory & Research Chemicals, Methyl Bromide, Metal Catalysts, Methylenedianiline, Naphthenates, Nitrosamines, Olefins, Oleylamine, Oxo Process, Petroleum Additives, Phenol, Phosgene, Phthalate Esters, Polychlorinated Biphenyls, Rubber Additives, Sodium Bromide, Specialty Acrylates/Methacrylates, Terephthalates, Titanium Dioxide, Toluenediamines, Trimellitate Esters, Vinyl Chloride, Vinylidene Chloride, and Water Additives — that have proactive interests in promoting safety, environmental stewardship, customer education, emergency response, and better product evaluations.

CHEMTREC®

CHEMTREC® is a public service established by the Chemical Manufacturers Association (CMA) and its members in 1971. It provides first responders, the transportation industry, medical professionals and others with information and technical assistance from chemical industry experts for incidents involving hazardous materials. The Center's emergency response services can be reached from anywhere in the United States, Canada, Puerto Rico, and the Virgin Islands through its toll-free emergency telephone number, 1-800-424-9300.

The CHEMTREC® Center was developed as both a resource for obtaining intermediate emergency response information to mitigate accidental chemical releases and as a means for emergency responders to obtain technical assistance from chemical industry product safety specialists, emergency response coordinators, toxicologists, physicians, and other industry experts to safely mitigate incidents involving chemicals. In 1992, the Center received reports in nearly 7,600 incidents, 78 percent of which were transportation-related, 13 percent non-transportation, and 8 percent medical in nature. Over half of the incidents reported occurred at terminals (e.g. trucking terminals). Highway and rail incidents accounted for over 40 percent.

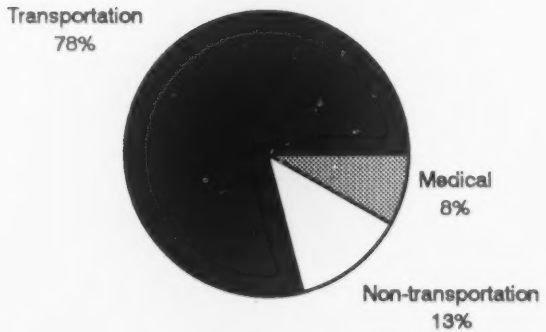
In 1985, the CHEMTREC® Center expanded its emergency response mission. The Chemical Industry Mutual Aid Network was established to address incidents involving those commodities not covered by one of the product-specific mutual aid plans. The network is comprised of emergency response teams from participating chemical companies and teams provided by commercial, for-hire contractors under contract to CMA. The primary objective of the program is to provide a chemical industry presence on the scene of chemical emergencies as soon as possible.

CHEMTREC® expanded its public services in 1985 and added toll-free nonemergency telephone lines to provide the general public, chemical users, industrial workers and others with access to nonemergency health, safety and environmental information about chemicals and chemical products. The Center's toll-free number for nonemergency information is 1-800-262-8200 and can be reached from anywhere in the United States and Canada. The line is staffed Monday through Friday from 9 a.m. to 6 p.m. Eastern time.

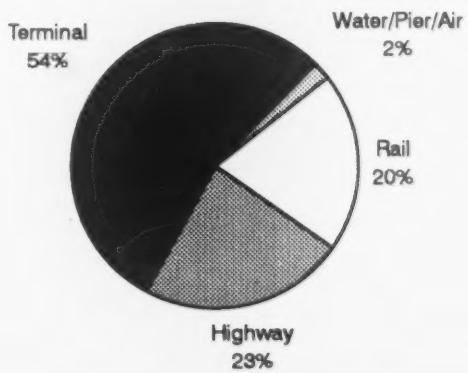
The CHEMTREC® Center also operates a lending library of audio-visual training programs and regularly conducts "hands-on" workshops for emergency responders. CHEMTREC® is an important component of CMA's Responsible Care® initiative, through which member companies have made a commitment to continually improve the industry's performance in health , safety and environmental quality. This includes increased emphasis on the safe transportation of chemicals, emergency preparedness and accident prevention, and providing emergency advice and assistance in the event an incident involving chemicals occurs.

Chemical Incidents Reported to CHEMTREC® in 1992

By Type



By Mode



What Is The Chemical Industry?

The chemical industry takes natural raw materials from earth, water, and air and converts them into valuable products tailor-made for consumers and the nation's industries (Figure A). The chemical industry's products have many applications:

- raw and basic materials for other industries;
- intermediate materials for other industries; and
- a wide variety of finished products for industry, agriculture, business and individual consumers.

Unlike most other industries, the chemical industry does not make one group or family of products derived from only a few key materials. It makes more than 60,000 chemical products from a vast array of metals, minerals, coal, oil, natural gas, vegetable oils, animal fats, and other raw materials.

Products of the chemical industry are pervasive, as shown in figures A-M; very few goods and services are produced in modern industrial societies without some input from the chemical industry. Chemicals are thus a "basic" industry that supplies every level of production and consumption. That is, it makes not only a wide variety of consumer goods, but products that are building blocks essential to our agricultural, construction, manufacturing, and service industries.

Synthetic fibers and permanent-press clothing, improved medicines, pharmaceuticals, health improvement products, better protective packaging materials, longer-lasting paints, stronger adhesives, more durable and safer synthetic tires, lighter-weight plastic automobile parts, and stronger composite materials in advanced aircraft and spacecraft are only a few of the thousands of the chemical industry's constant stream of new and innovative products.

The chemical industry is a keystone of the U.S. economy. On a value added basis it is about 10 percent of U.S. manufacturing and produces about 1.8 percent of U.S. GDP. Despite its keystone stature and the enormous range of its products, the size, nature and critical contributions of the chemical industry to the economy are not highly visible, probably because most chemical companies are not directly involved in the production of consumer products.

The charts which follow provide a simplified overview of some key parts of the chemical production chain, from raw material inputs to valued outputs.

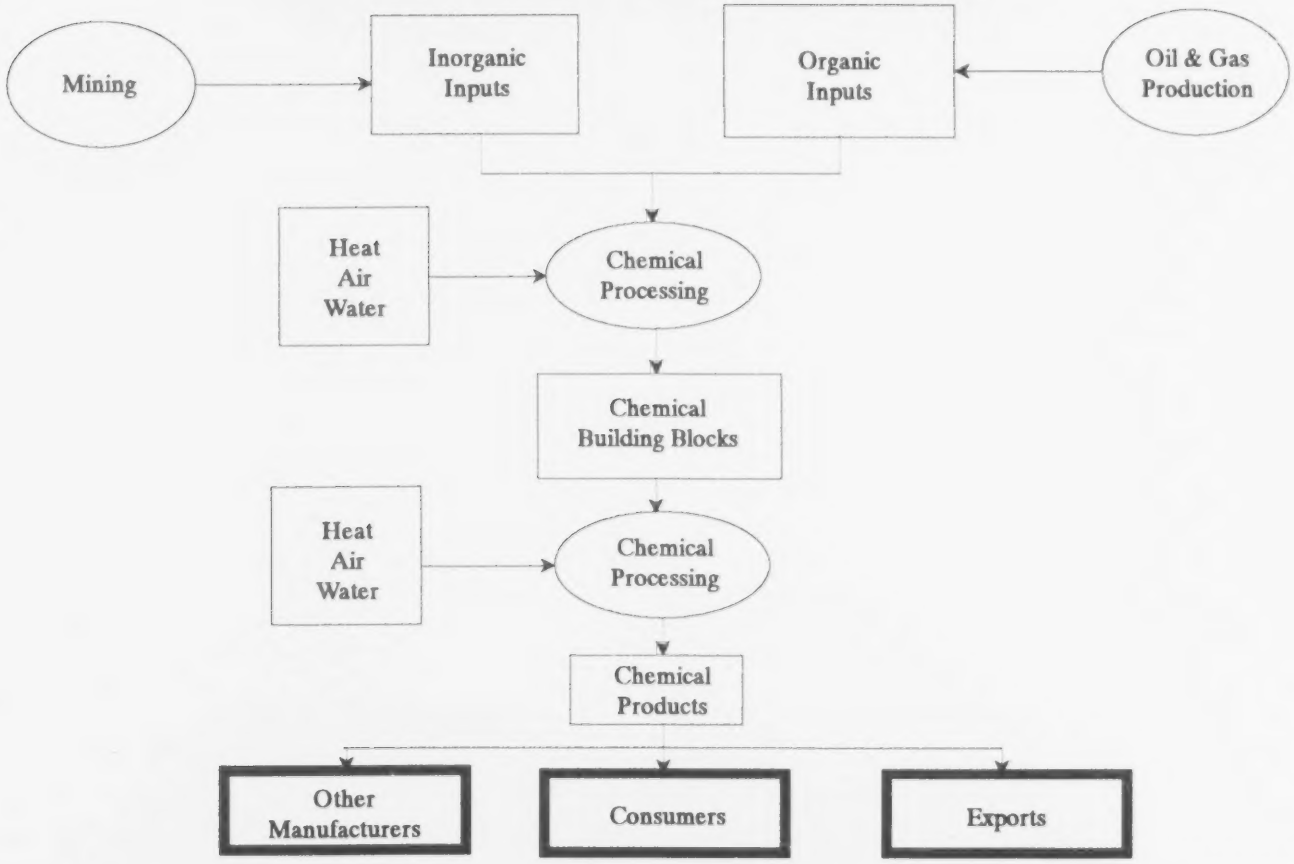
There are two kinds of chemistry, organic and inorganic. Organic inputs, like oil and natural gas, contain hydrocarbons which form the backbone of final organic chemical outputs. In the first stage of processing (Figure B) raw materials are refined to produce primary outputs like benzene and ethylene. Primary outputs like these are the building blocks of the chemical industry. In subsequent processing (Figures C-J) chemicals such as chlorine are added to the hydrocarbon backbones to give the compounds certain desired characteristics. The final output may, for example, be nylon or polyester fiber, plastic, a pharmaceutical product, or other products often not thought of as chemical industry outputs.

Inorganic inputs are often compounds composed of the 107 natural elements of the earth (Figure K). Salt -- a simple compound formed from sodium (Na) and chlorine (Cl) -- can be broken down by electrolysis to produce chlorine and caustic soda (sodium hydroxide). Chlorine (Figure M), a common inorganic chemical, is used both by industries and consumers. The paper industry, for example, uses chlorine to bleach pulp and consumers may appreciate it as a means of keeping their clothes white and their drinking water safe. Caustic soda is another inorganic chemical used extensively in manufacturing processes and in the production of soaps and detergents.

The figures which follow do not attempt to report all chemical products and processes. The vast spectrum of chemical outputs makes it impractical to describe more than a few simple process chains.

Figure A:

What Is Chemistry?



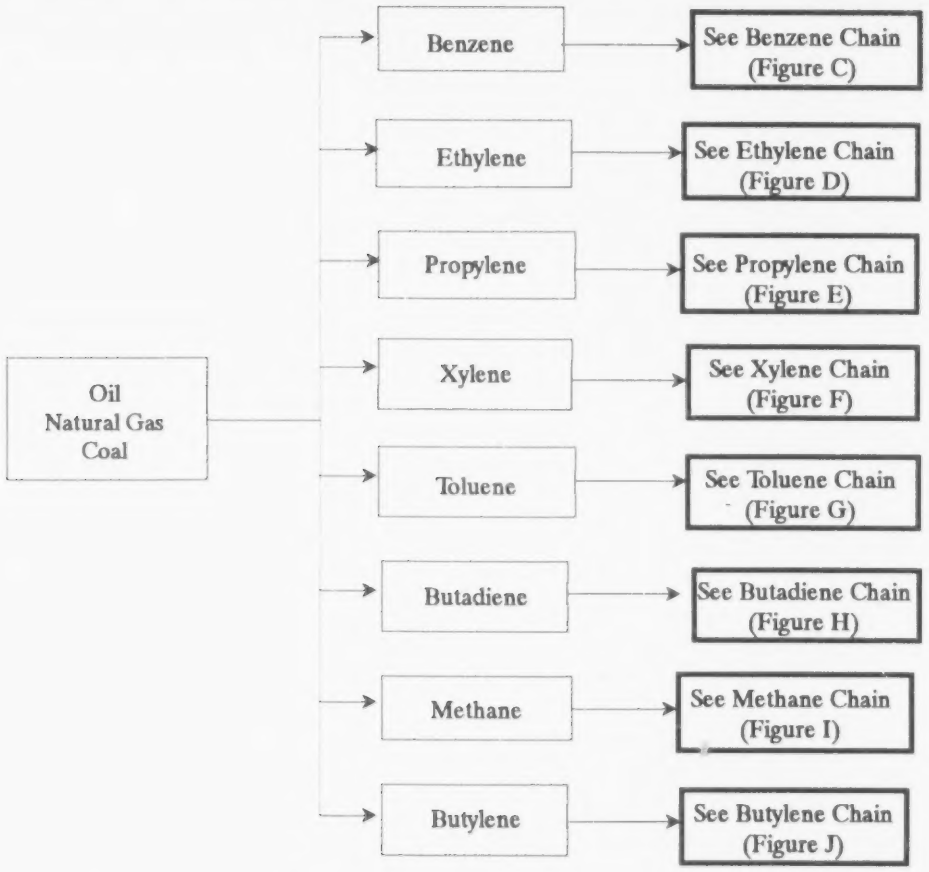
❑ Chemistry combines organic and inorganic materials from the earth with heat, air, and water to make products useful in modern civilization.

❑ Organic chemicals begin with raw materials containing hydrocarbons such as oil, natural gas, and coal.

❑ Inorganic chemicals do not contain carbon but are made from ores taken from the earth, such as salt. Compounds such as salt are a combination of elements that are listed in the "Periodic Table of Elements" (Figure K)

Figure B:

Organic Chemical Chain



❑ The organic chemical inputs -- oil, natural gas, and coal-- yield eight basic, first level derivative chemicals. Some examples of products resulting from further processing of each of these eight first level chemicals are shown in figures C through J.

Figure C:

Benzene Chain

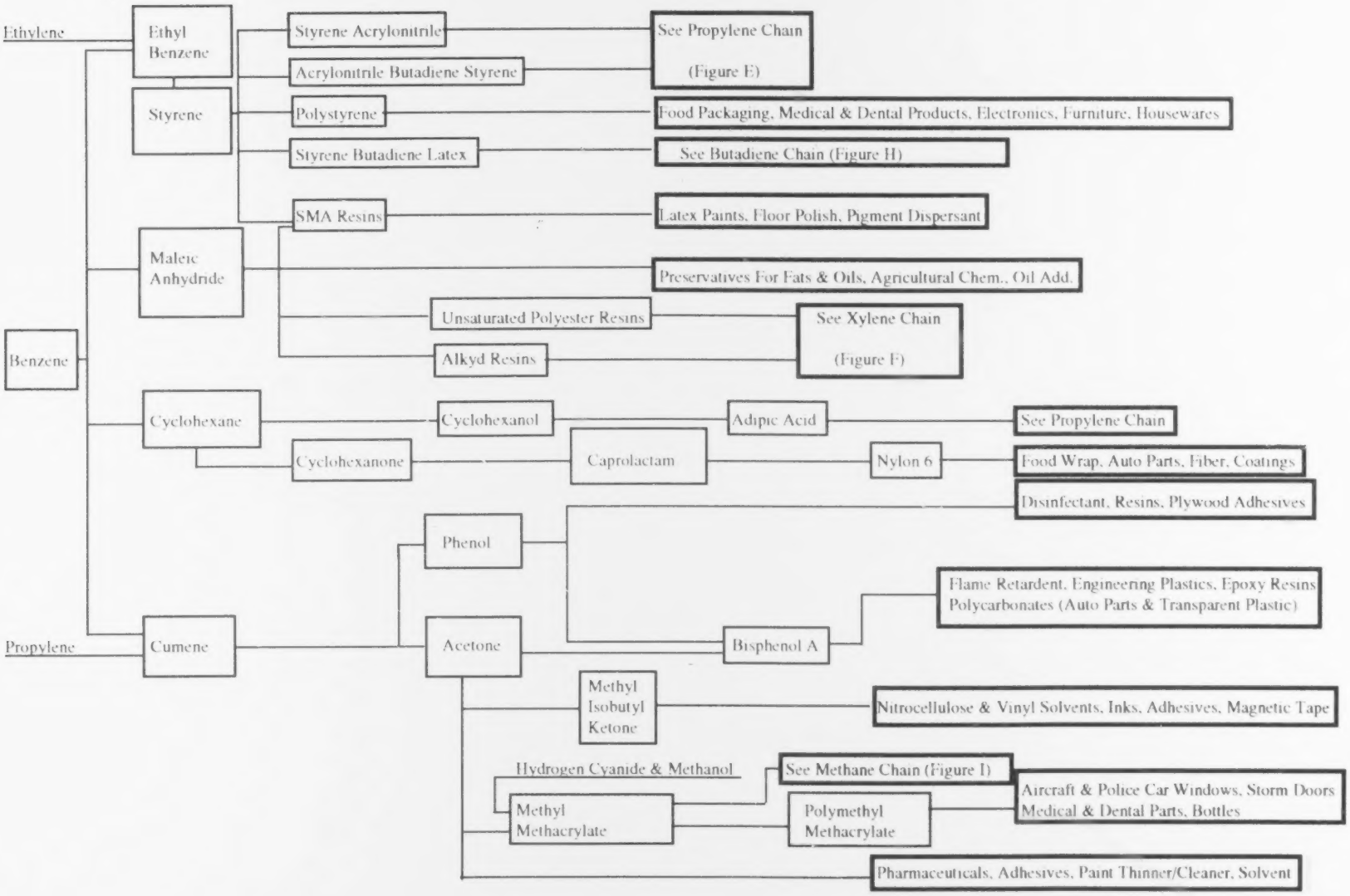


Figure D:

Ethylene Chain

Figure E:

Propylene Chain

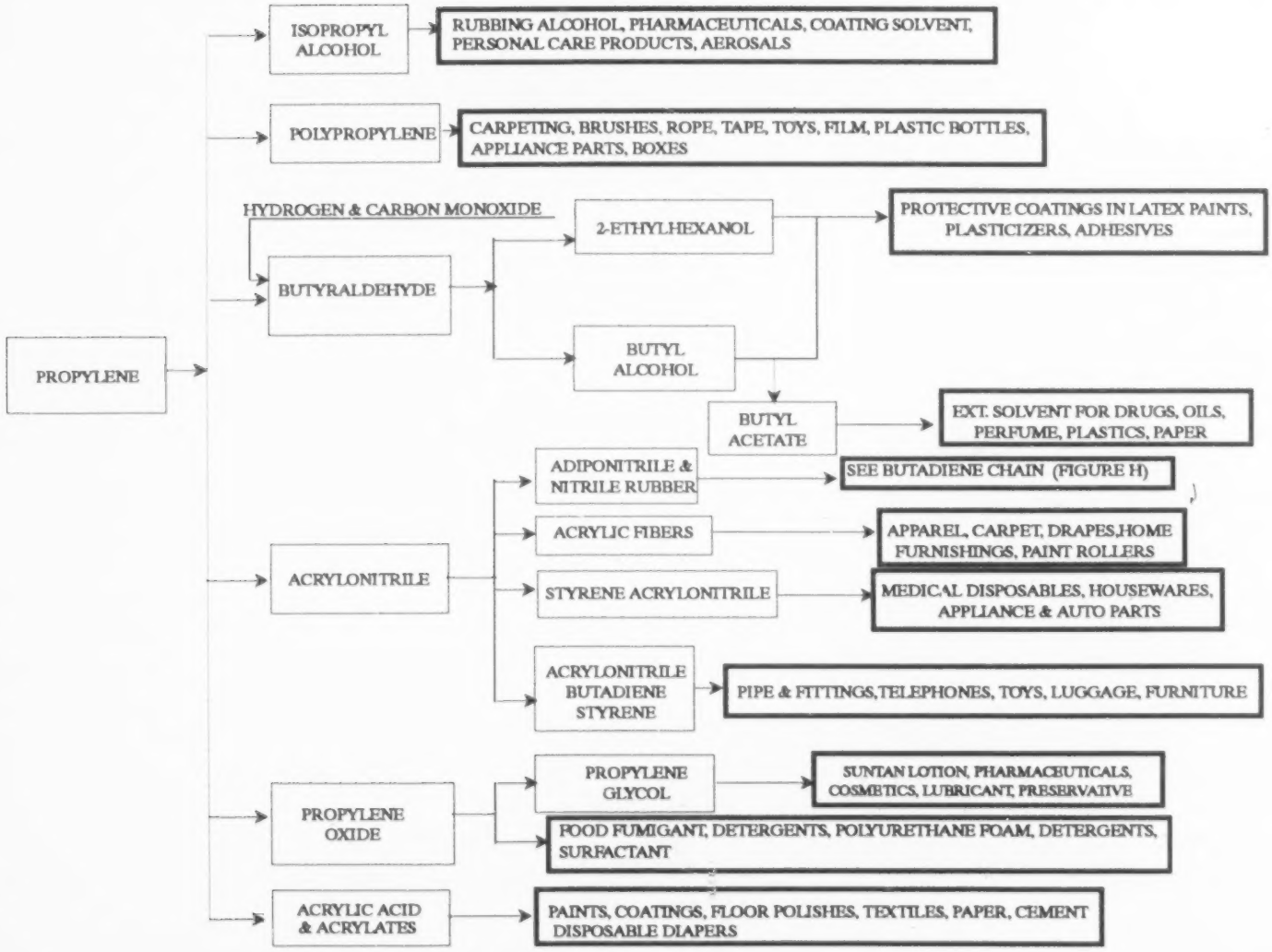

PROPYLENE
ISOPROPYL ALCOHOL
RUBBING ALCOHOL, PHARMACEUTICALS, COATING SOLVENT, PERSONAL CARE PRODUCTS, AEROSALS
POLYPROPYLENE
CARPETING, BRUSHES, ROPE, TAPE, TOYS, FILM, PLASTIC BOTTLES, APPLIANCE PARTS, BOXES
HYDROGEN & CARBON MONOXIDE
BUTYRALDEHYDE
2-ETHYLHEXANOL
PROTECTIVE COATINGS IN LATEX PAINTS, PLASTICIZERS, ADHESIVES
BUTYL ALCOHOL
BUTYL ACETATE
EXT. SOLVENT FOR DRUGS, OILS, PERFUME, PLASTICS, PAPER
ACRYLONITRILE
ADIPONITRILE & NITRILE RUBBER
SEE BUTADIENE CHAIN (FIGURE H)
ACRYLIC FIBERS
APPAREL, CARPET, DRAPES,HOME FURNISHINGS, PAINT ROLLERS
STYRENE ACRYLONITRILE
MEDICAL DISPOSABLES, HOUSEWARES, APPLIANCE & AUTO PARTS
ACRYLONITRILE BUTADIENE STYRENE
PIPE & FITTINGS,TELEPHONES, TOYS, LUGGAGE, FURNITURE
PROPYLENE OXIDE
PROPYLENE GLYCOL
SUNTAN LOTION, PHARMACEUTICALS, COSMETICS, LUBRICANT, PRESERVAITVE
FOOD FUMIGANT, DETERGENTS, POLYURETHANE FOAM, DETERGENTS, SURFACTANT
ACRYLIC ACID & ACRYLATES
PAINTS, COATINGS, FLOOR POLISHES, TEXTILES, PAPER, CEMENT DISPOSABLE DIAPERS

Figure F:

Xylene Chain

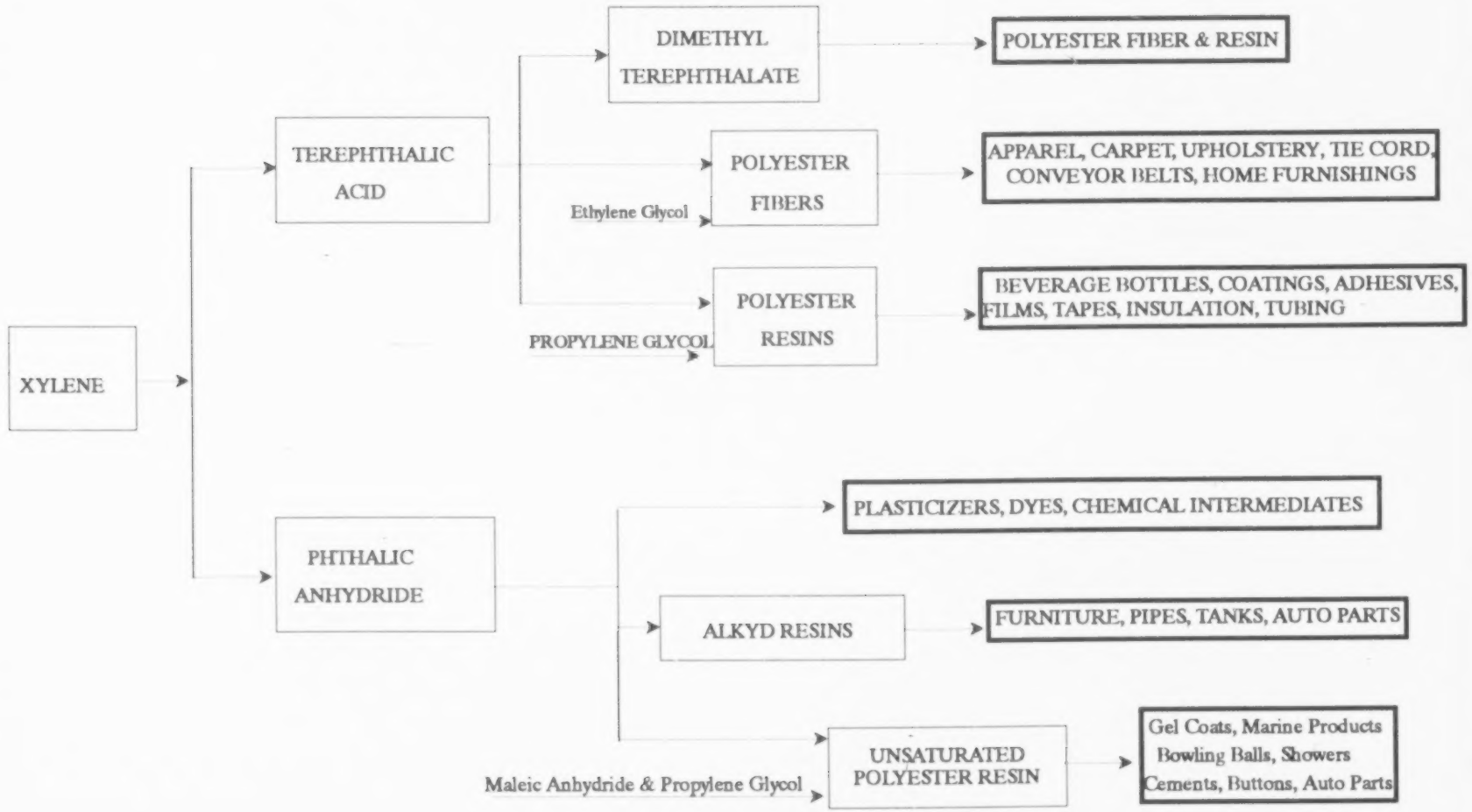


Figure G:

Toluene Chain

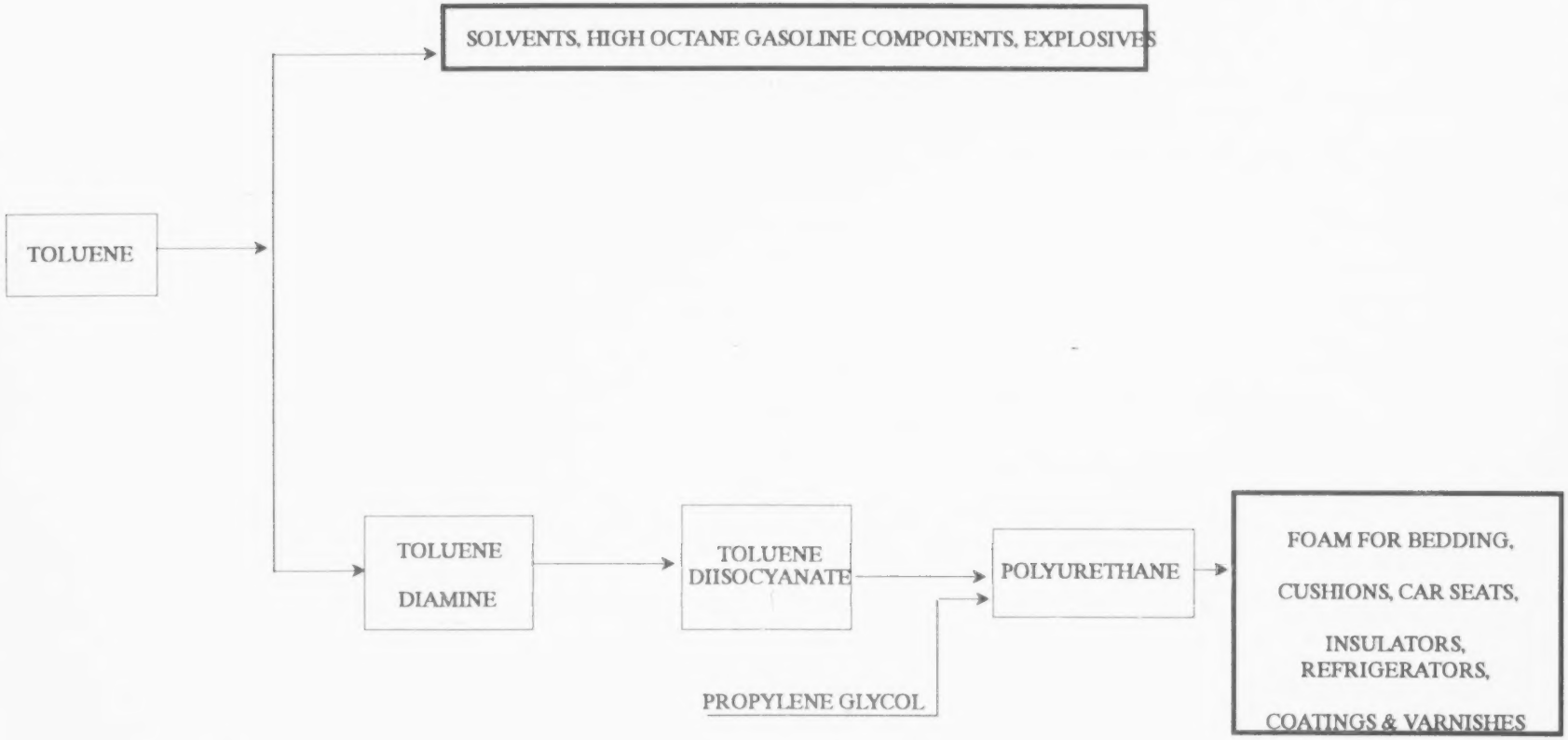


Figure H:

Butadiene Chain

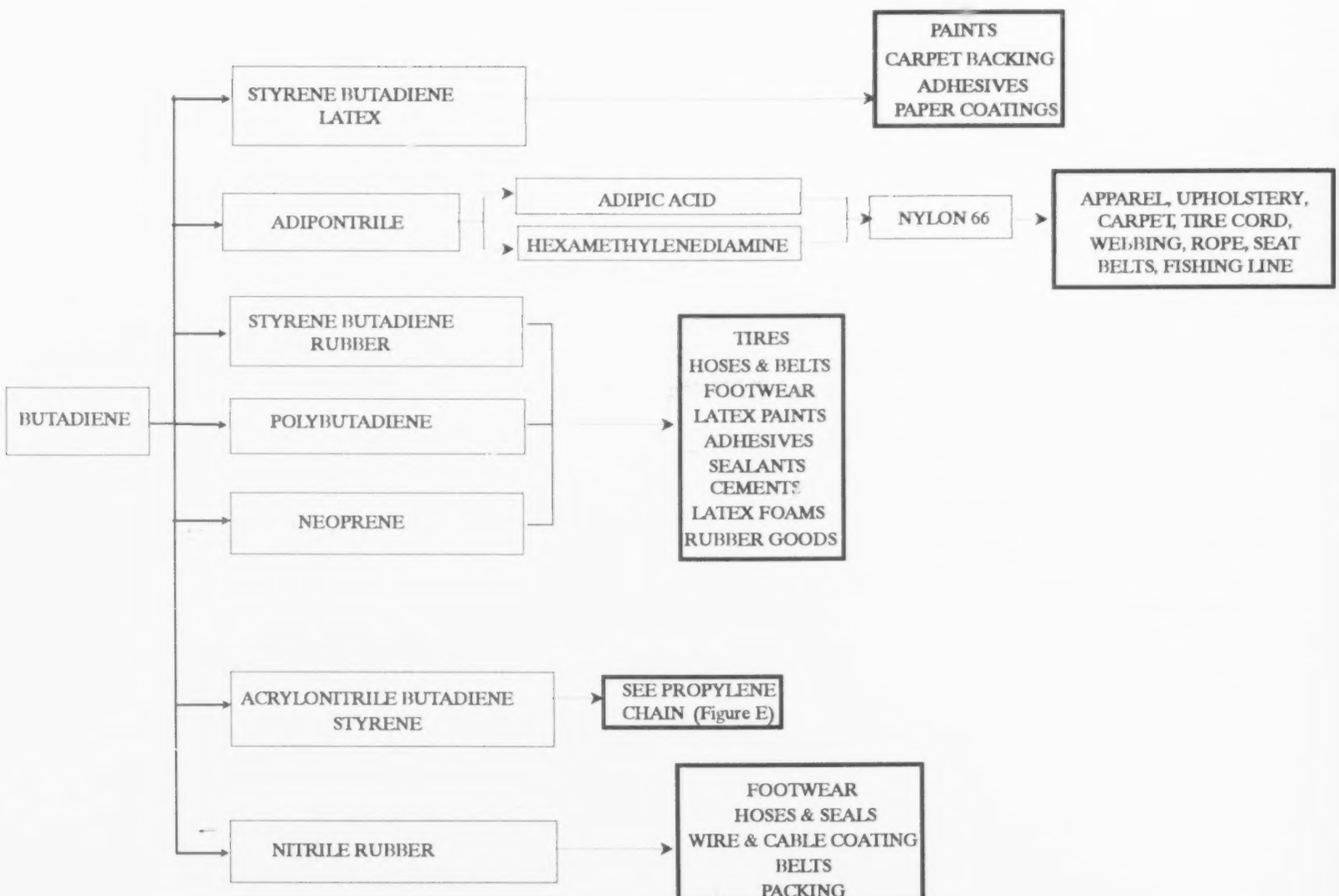


Figure I:

Methane Chain

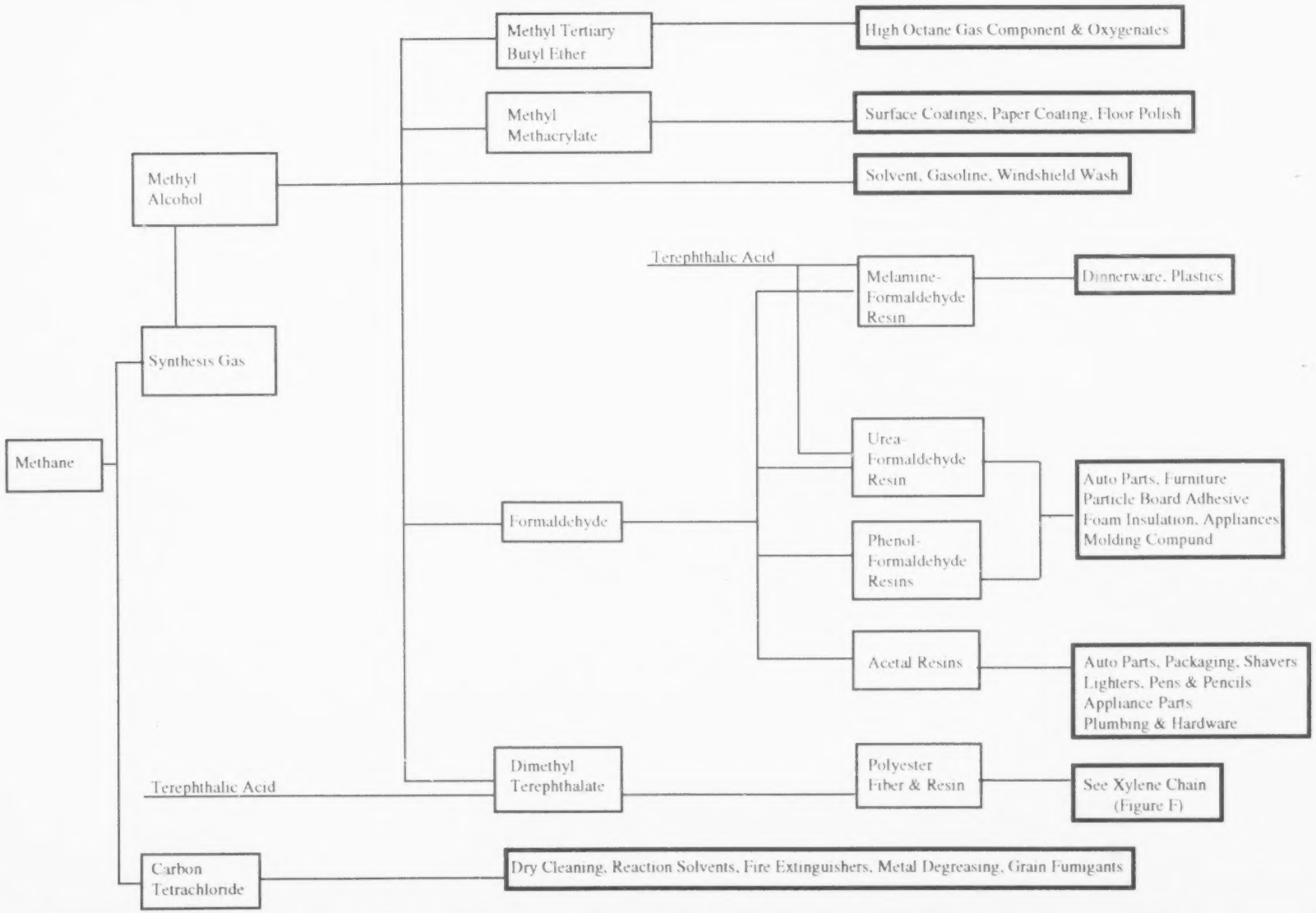


Figure J:

Butylenes Chain

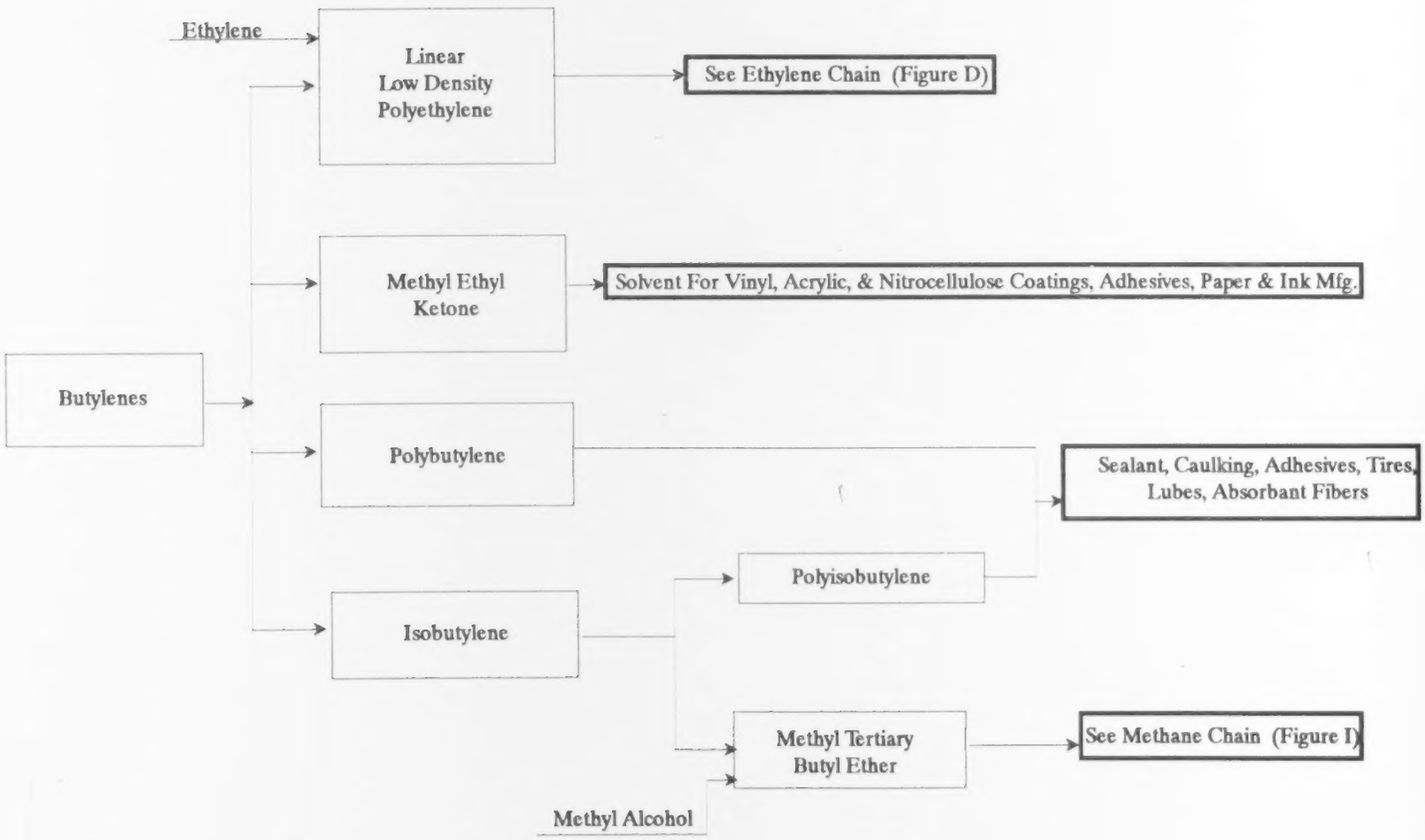
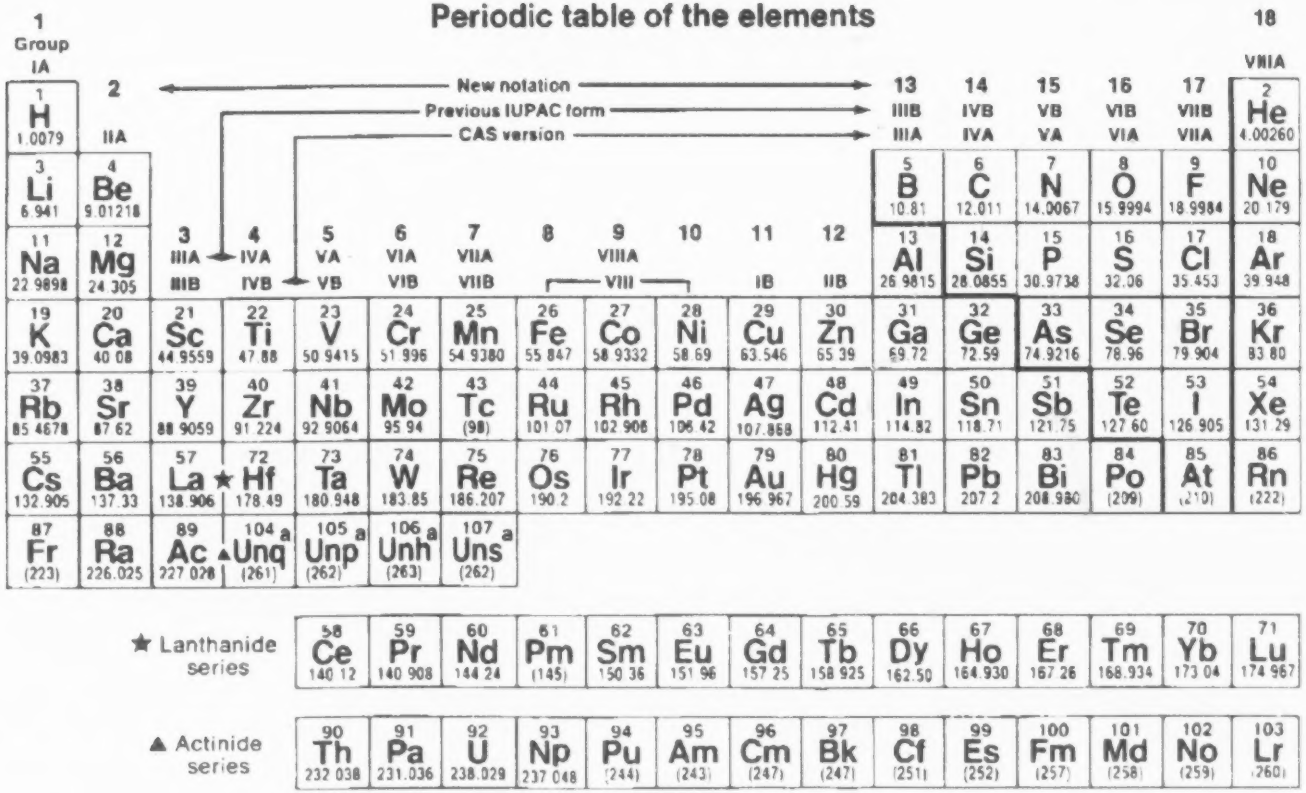


Figure K:

Foundations of Inorganic Chemistry



❑ The "Periodic Table" lists the 107 elements that are the basic building blocks of the earth. These elements can be considered the foundation of inorganic chemistry. Elements combine to form compounds such as salt (NaCl) which is a compound formed from sodium (Na) and chlorine (Cl).

❑ Salt (NaCl) can be used to make caustic soda (Figure L) and chlorine (Figure M). They are examples of inorganic chemicals -- those that do not contain carbon.

FIGURE L:

CAUSTIC SODA

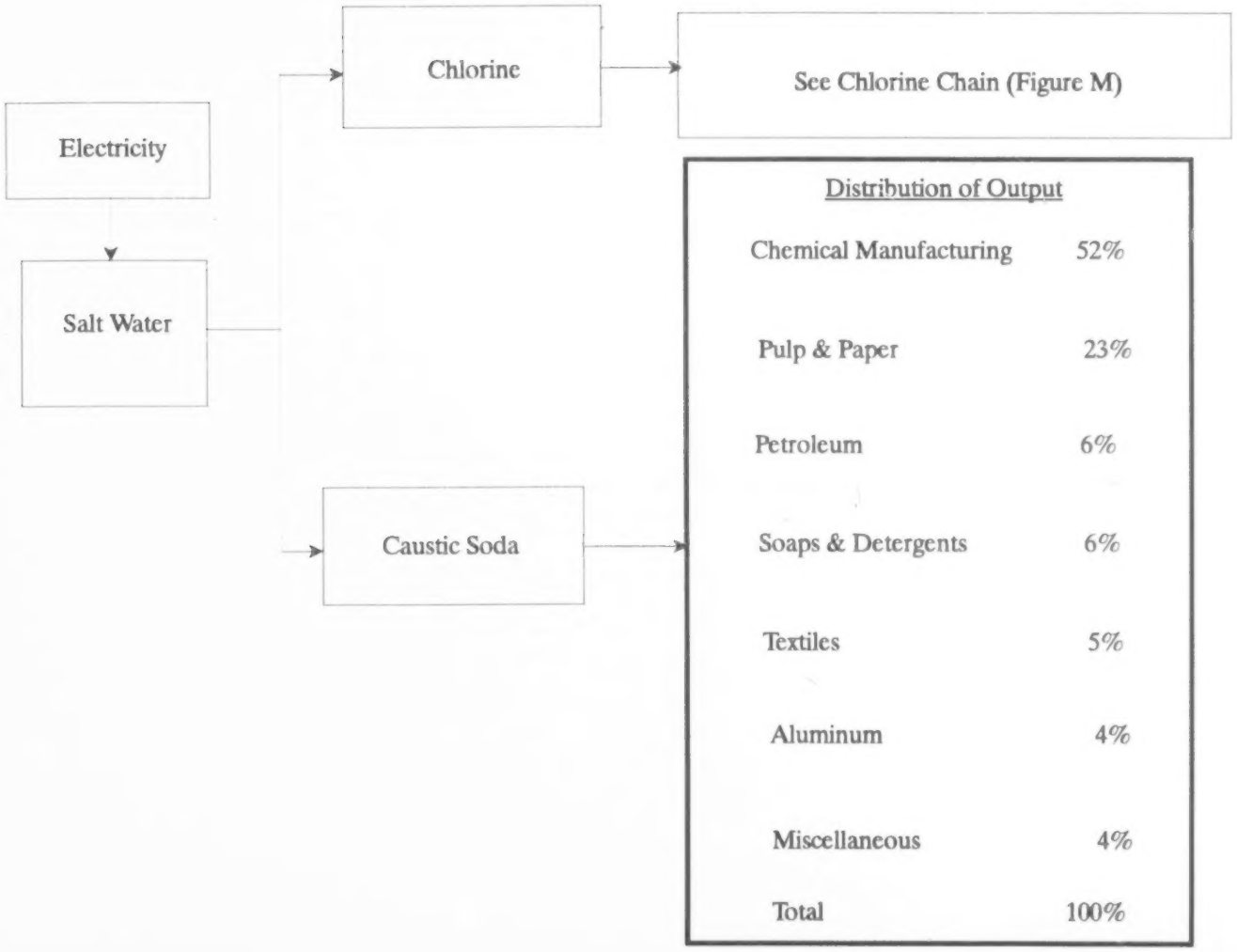
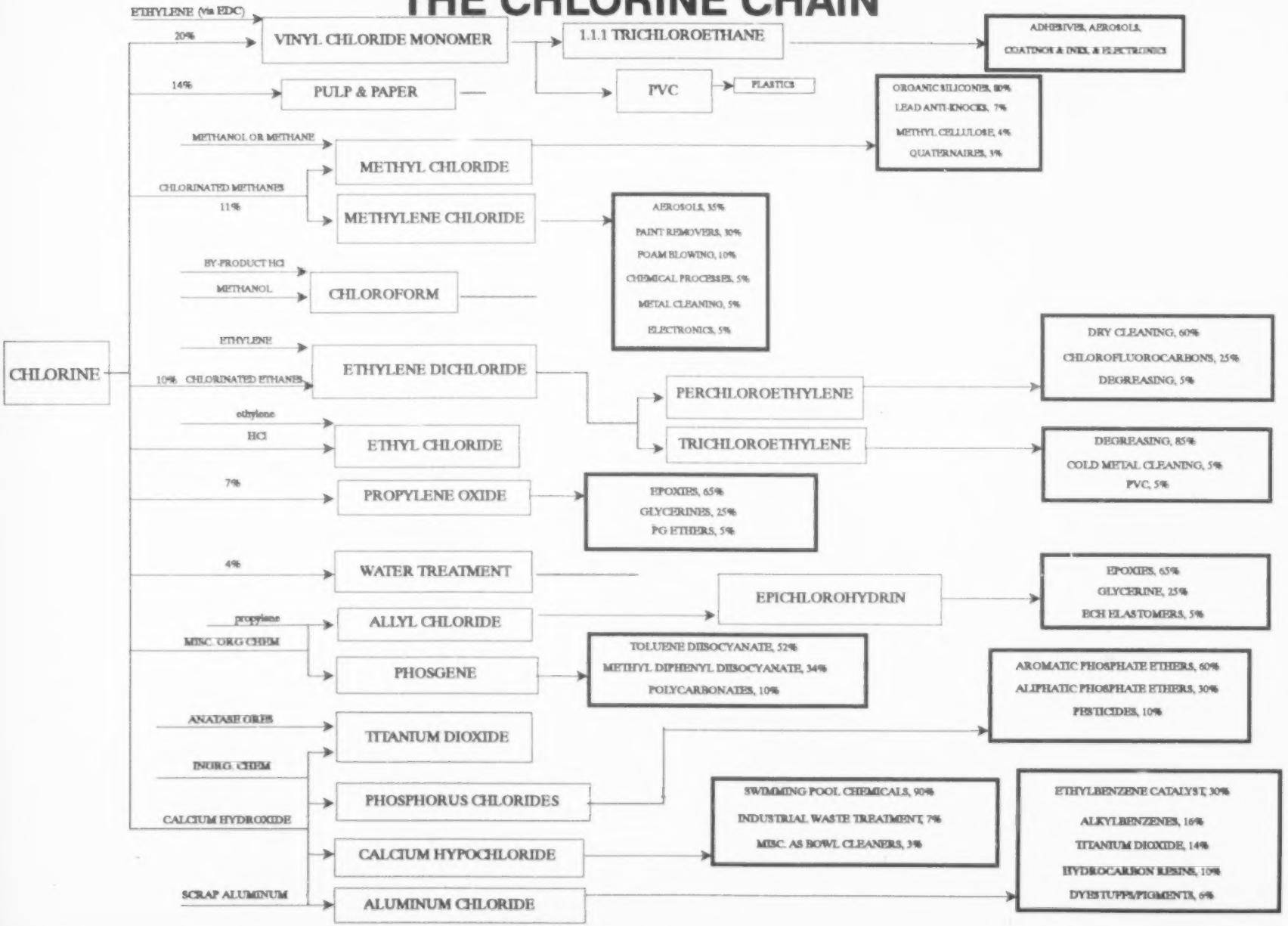


FIGURE M:
THE CHLORINE CHAIN



Section 1
Summary of Industry Performance

The U.S. chemical industry makes a wide variety of consumer goods as well as tens of thousands of products that are inputs to the production processes of the construction, manufacturing, service, and agriculture industries. Although one of the oldest U.S. industries, chemicals is a dynamic, high-technology, internationally competitive industry. It is the keystone of U.S. manufacturing, creating new products and processes essential to raising U.S. productivity and living standards.

Chemicals is a $1.3 trillion global industry that is characterized by large volumes of foreign direct investment and international trade. The U.S. chemical industry is the worlds largest, accounting for about 23 percent of the world total. Ranking next in total production are Japan, Germany and France. The U.S. chemical industry is the second largest exporter of chemicals (after Germany), accounting for about 13 percent of total world exports of chemicals.

The U.S. chemical industry produces over 70,000 different products and in 1992 employed 1.1 million people, about 5.9 percent of the manufacturing total. Included are over 80,000 scientists, engineers, and technicians who are engaged in research and development (R&D).

About 53 percent of the industry's employees are production workers, who earned average wages in 1992 that were 26 percent greater than those for manufacturing as a whole.

The chemical industry produces about 1.8 percent of total U.S. Gross Domestic Product -- and 10 percent of all U.S. manufacturing. It is the third largest manufacturing sector.

The chemical industry is strong and growing. In 1992, shipments reached $297 billion, a record, and a 2.8 percent increase over 1991 levels.

The industry's trade surplus in 1992 was $16.8 billion. Exports of $44 billion exceeded total U.S. agricultural exports, and were 2.3 percent above the previous year. Imports of $27.2 billion were 14 percent above 1991 imports.

Operating profits of $24.2 billion in 1992 were down from the 1989 peak, but nevertheless provided the basis for R&D and capital expenditures for new plant and equipment needed to maintain the industry's international competitiveness.

Investment in new plant and equipment reached $23 billion in 1992, a 6.9 percent increase over 1991.

The chemical industry's 1992 operating rate was 80.9 percent of capacity, up slightly from 80.3 percent in 1991.

TABLE 1.1

THE U.S. CHEMICAL INDUSTRY: A SUMMARY OF SELECTED INDICATORS

	(Units:)	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates 1992/82	1992/87	1992/91
Production Index	*(1987=100)*	89	82	88	91	91	95	100	106	109	112	111	115	3.5%	2.8%	3.3%
Value Added (*1)	*(Billion 1987$)*	62	64	68	66	67	75	82	83	84	88	n/a	n/a	--	--	--
Corporate Sales	*(Billion $)*	189	186	201	210	203	206	225	262	278	287	298	317	5.4%	7.1%	6.4%
Income After Taxes	*(Billion $)*	13.0	10.3	11.6	13.9	9.5	12.9	16.6	23.7	24.5	23.4	20.0	13.2	2.5%	-4.4%	-33.8%
Total Assets	*(Billion $)*	172	182	188	193	205	217	244	278	293	325	358	384	7.8%	9.5%	7.5%
Net Return on Sales (*2)		6.9%	5.5%	5.8%	6.6%	4.7%	6.3%	7.4%	9.0%	8.8%	8.1%	6.7%	4.2%	--	--	--
Net Return on Assets (*3)		7.6%	5.7%	6.2%	7.2%	4.6%	5.9%	6.8%	8.5%	8.4%	7.2%	5.6%	3.4%	--	--	--
Operating Rate (*4)		78%	71%	75%	78%	77%	79%	82%	84%	84%	83%	80%	81%	1.3%	-0.2%	0.7%
Producer Price Index (chemicals)	*(1982=100)*	98	100	100	103	104	103	106	116	123	124	126	126	2.3%	3.4%	0.2%
R & D Funding	*(Billion $)*	5.6	6.6	7.2	7.9	8.5	8.8	9.6	10.8	11.5	12.3	13.2	n/a	--	--	--
Gross Investment in the U.S.	*(Billion $)*	11.8	11.6	9.2	9.8	10.9	10.2	11.9	14.6	18.8	18.9	22.7	23.3	7.2%	14.4%	2.8%
Total Employment	*(Millions)*	1.11	1.08	1.04	1.05	1.04	1.02	1.03	1.06	1.08	1.09	1.07	1.07	0.0%	0.9%	-0.1%
Labor Productivity	*(1987=100)*	83	81	89	91	92	97	100	102	104	106	109	115	3.5%	2.8%	5.4%
Average Wages (Prod'n Workers)	*($/hr)*	9.12	9.97	10.58	11.07	11.57	11.97	12.36	12.71	13.09	13.54	14.02	14.45	3.8%	3.2%	3.1%
Exports	*(Billion $)*	21.2	19.9	20.0	22.8	21.8	22.5	26.0	31.9	36.5	39.0	43.0	44.0	8.2%	11.1%	2.3%
Imports	*(Billion $)*	9.5	9.5	10.9	13.8	14.6	15.1	16.4	19.9	20.5	22.2	23.8	27.2	11.1%	10.7%	14.3%
Trade Surplus	*(Billion $)*	11.7	10.4	9.1	9.0	7.2	7.4	9.7	12.0	16.0	16.8	19.2	16.7	4.9%	11.6%	-12.6%
Share of World Chemical Exports		16.0%	15.0%	14.1%	14.2%	13.8%	11.6%	11.6%	12.1%	13.0%	12.0%	12.9%	n/a	--	--	--

*1) These figures are for GDP by industry, which is equivalent to value added.
*2) After-tax income as a share of total sales.
*3) After-tax income as a share of total assets.
*4) The operating rate is also referred to as the "capacity utilization rate."

Source: U.S. Department of Commerce, U.S. Department of Labor, Federal Reserve Board, National Science Foundation, and CMA World Manufactures Trade Database.

Section 2
Production, Prices, and Financial Data

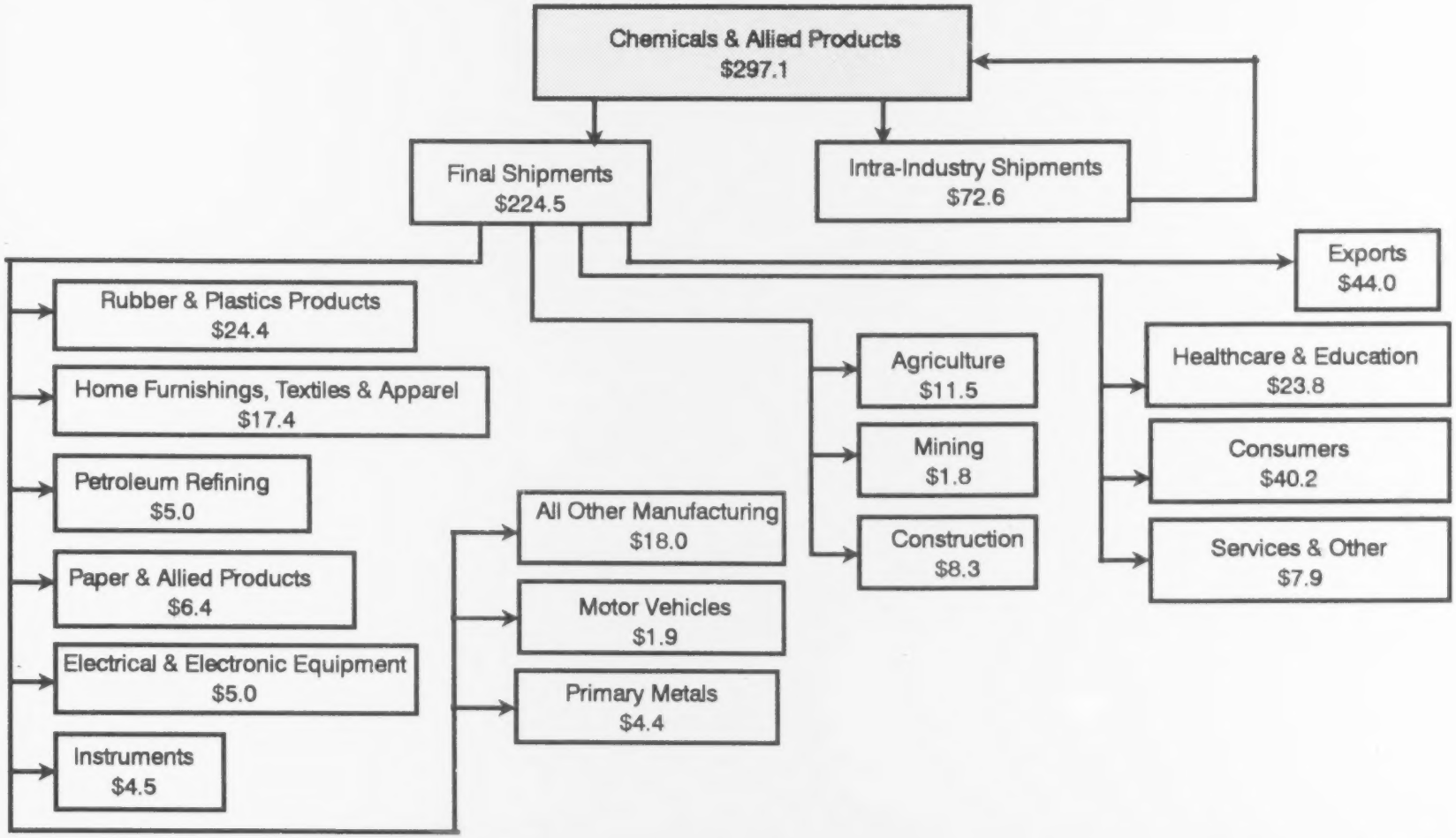
The $297 billion shipments of the U.S. chemical industry in 1992 include a wide variety of consumer goods as well as tens of thousands of products that are used extensively in the construction, manufacturing, service, and agricultural sectors. Dating from 1635, the chemical industry is one of the oldest U.S. industries. However, it is also a dynamic, high-technology industry, investing billions of dollars annually in research and development (R&D). The U.S. chemical industry has remained internationally competitive, constantly creating new processes and producing more than 60,000 products that raise U.S. productivity and living standards.

The chemical industry is a key part of manufacturing and a key supplier to other manufacturing industries (Chart 2.1). The chemical industry contributed about 1.8 percent of U.S. gross domestic product in 1990, and about 10 percent of all U.S. manufacturing (Chart 2.2). The chemical industry itself is the largest purchaser of its own production of chemicals, consuming 24 percent of the industry's output in 1992. The rest of manufacturing -- which includes a whole variety of industries engaged in mechanically or chemically transforming materials into new tangible goods -- purchases 29 percent of the U.S. chemical industry's output. Large purchasers of chemicals in manufacturing include rubber & plastic products, textiles, apparel, petroleum, paper & allied products, and primary metals. Large non-manufacturing end-uses for chemicals include agriculture, construction, health care, and consumers.

In 1992, the U.S. chemical industry's production volume increased 3.3 percent, faster than the U.S. economy overall. Profits from operations in 1992 of $24.2 billion provided the basis for R&D spending and capital expenditures for new plant and equipment needed to maintain the industry's international competitiveness.

Composition of the industry has been changing, with increasing diversification into high-technology fields, such as pharmaceuticals, biotechnology, and advanced materials that have applications in transportation and other industries. The race to create new products and process technologies necessary to sustain a competitive edge in U.S. and world markets has increased the importance of R&D spending.

Chart 2.1
U.S. Chemical Industry Flow Chart, 1992

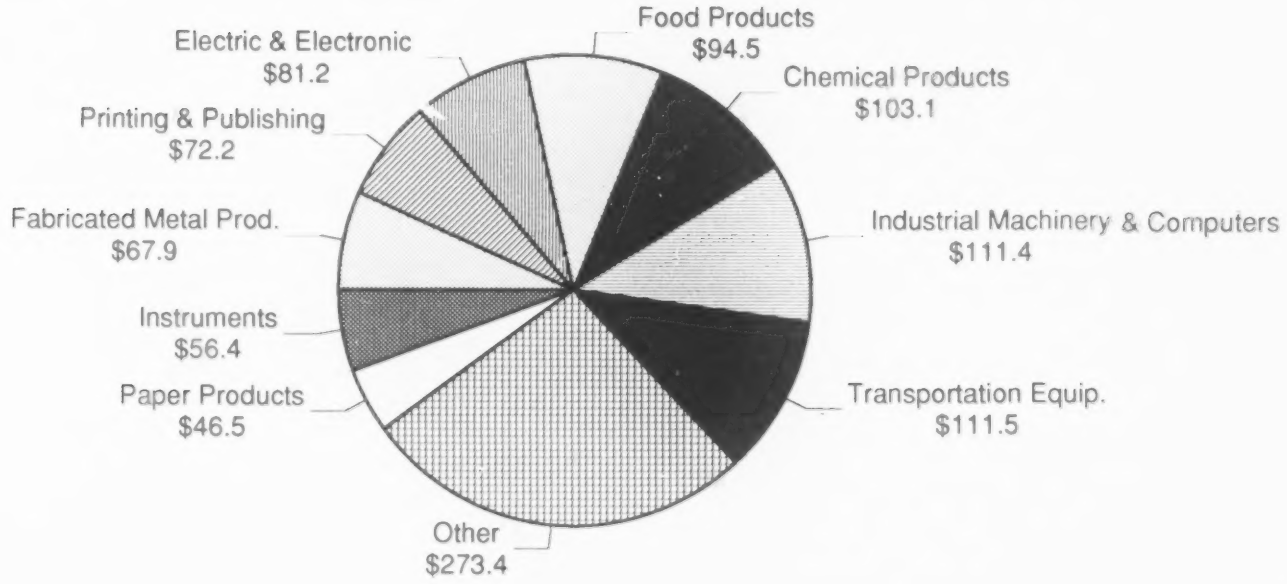


Above are estimates of the direct uses of the U.S. chemical industry's output. These estimates are based on the 1987 Input-Output (I-O) Tables of the U.S. economy with some adjustments. The estimates reflect direct purchases by the consuming industry or sector. In effect, the chart shows which industries or sectors are customers of the chemical industry. Indirect uses of chemicals incorporated into the outputs of other industries are not included. For example, these data do not reflect the motor vehicle sector's purchases of tires from the rubber & plastics products industry, which purchases synthetic rubber to make tires. The value of this synthetic rubber is not included in the $1.9 billion figure for motor vehicles. Thus, the total value of chemicals used in products produced by the automobile industry is actually several times larger than indicated in the above type of presentation.

The manufacturing sector accounted for 18 percent of U.S. gross domestic product in 1990. The chemical industry, in turn, made up 10 percent of the manufacturing sector's GDP -- larger than all but two of the sector's industry groups:

Chart 2.2

GDP by Industry:
The U.S. Manufacturing Sector, 1990

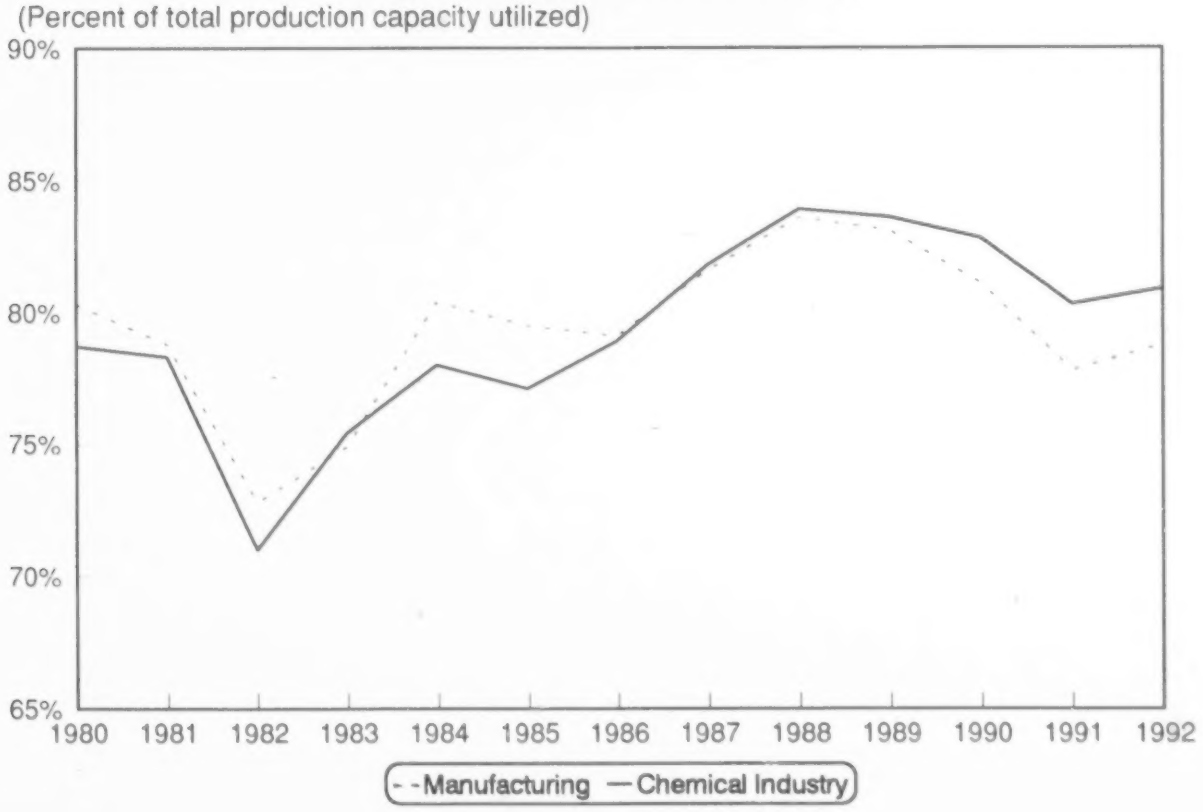


(Manufacturing Total: $1.02 Trillion)

From 1980 to 1992, capacity utilization in the U.S. chemical industry averaged about 79 percent -- the same as for manufacturing as a whole:

Chart 2.3

Capacity Utilization



The low point shown above marks the recession of the early 1980s. Though capacity utilization has fallen from its 1988 high, chemical-industry production has risen 8.5 percent from 1988 to 1992, and manufacturing production has risen 2.1 percent. The1992 figures show signs of a modest recovery.

TABLE 2.1

INDUSTRIAL PRODUCTION INDEXES
(1987=100)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Manufacturing:	56.4	78.8	76.6	80.9	89.3	91.6	94.3	100.0	104.7	106.4	106.1	103.7	106.9	3.4%	1.3%	3.1%
Chemicals & Allied Products:	55.9	87.8	81.8	87.5	91.4	91.4	94.6	100.0	106.0	109.2	111.7	111.3	115.0	3.5%	2.8%	3.3%
Industrial Inorganic Chemicals:	79.4	96.5	86.5	92.1	96.9	96.1	95.1	100.0	104.7	108.4	118.9	115.7	128.9	4.1%	5.2%	11.4%
Alkalies and Chlorine	n/a	101.5	82.1	87.9	95.3	93.6	92.1	100.0	104.8	107.4	107.2	104.2	105.4	2.5%	1.1%	1.2%
Industrial Gases	n/a	91.5	80.1	85.9	97.5	92.8	98.8	100.0	104.1	108.0	109.2	111.9	112.7	3.5%	2.4%	0.7%
Inorganic Pigments	n/a	90.6	79.1	87.3	89.0	95.1	96.2	100.0	111.4	114.0	109.0	101.5	118.2	4.1%	3.4%	16.5%
Industrial Inorganic Chemicals, nec	96.3	96.8	89.2	94.3	98.0	97.2	94.7	100.0	103.5	107.7	123.8	120.6	135.0	4.2%	6.2%	11.9%
Plastic Materials and Synthetics:	39.5	71.2	71.8	84.3	88.9	86.9	91.6	100.0	104.3	107.7	105.8	102.9	110.2	4.4%	2.0%	7.1%
Plastic Materials and Resins	30.4	64.2	64.4	74.4	81.1	84.1	88.2	100.0	104.0	106.0	106.7	101.5	108.3	5.3%	1.6%	6.7%
Man-Made Fibers	47.5	74.9	76.4	92.3	93.3	86.6	93.7	100.0	103.5	110.5	102.8	103.3	110.1	3.7%	1.9%	6.6%
Drugs and Medicines:	46.0	80.2	82.7	86.1	86.9	88.5	96.7	100.0	104.9	108.6	112.6	120.6	129.3	4.6%	5.3%	7.2%
Soap and Toiletries	68.1	103.5	89.2	91.4	90.6	91.3	96.7	100.0	106.4	107.3	109.4	108.4	105.0	1.6%	1.0%	-3.1%
Paints and Allied Products	81.3	87.0	78.8	84.6	91.8	95.7	97.5	100.0	103.1	98.9	97.1	90.6	93.8	1.8%	-1.3%	3.5%
Industrial Organic Chemicals	n/a	92.8	81.0	89.9	93.4	94.1	95.1	100.0	111.6	117.8	119.4	115.8	113.5	3.4%	2.6%	-2.0%
Agricultural Chemicals	52.9	97.2	88.8	87.5	102.0	96.1	88.5	100.0	106.5	115.3	119.3	116.3	124.0	3.4%	4.4%	6.6%
Miscellaneous Chemical Products	46.0	80.2	82.7	86.1	86.9	88.5	96.7	100.0	101.1	101.6	103.3	99.7	96.8	1.6%	-0.6%	-2.9%

Source: Federal Reserve Board

TABLE 2.2

CAPACITY UTILIZATION *
(Percent)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Rates of Change: 1992/82	1992/87	1992/91
Manufacturing	79.7	80.3	72.8	74.9	80.4	79.5	79.1	81.6	83.6	83.1	81.1	77.8	78.8	0.8%	-0.7%	1.3%
Chemicals & Allied Products	77.9	78.7	71.0	75.4	78.0	77.1	78.9	81.8	83.9	83.6	82.8	80.3	80.9	1.3%	-0.2%	0.7%

* Capacity utilization is also referred to as the "operating rate."
Source: Federal Reserve Board

TABLE 2.3

GDP BY INDUSTRY
(Billions of 1987 dollars)

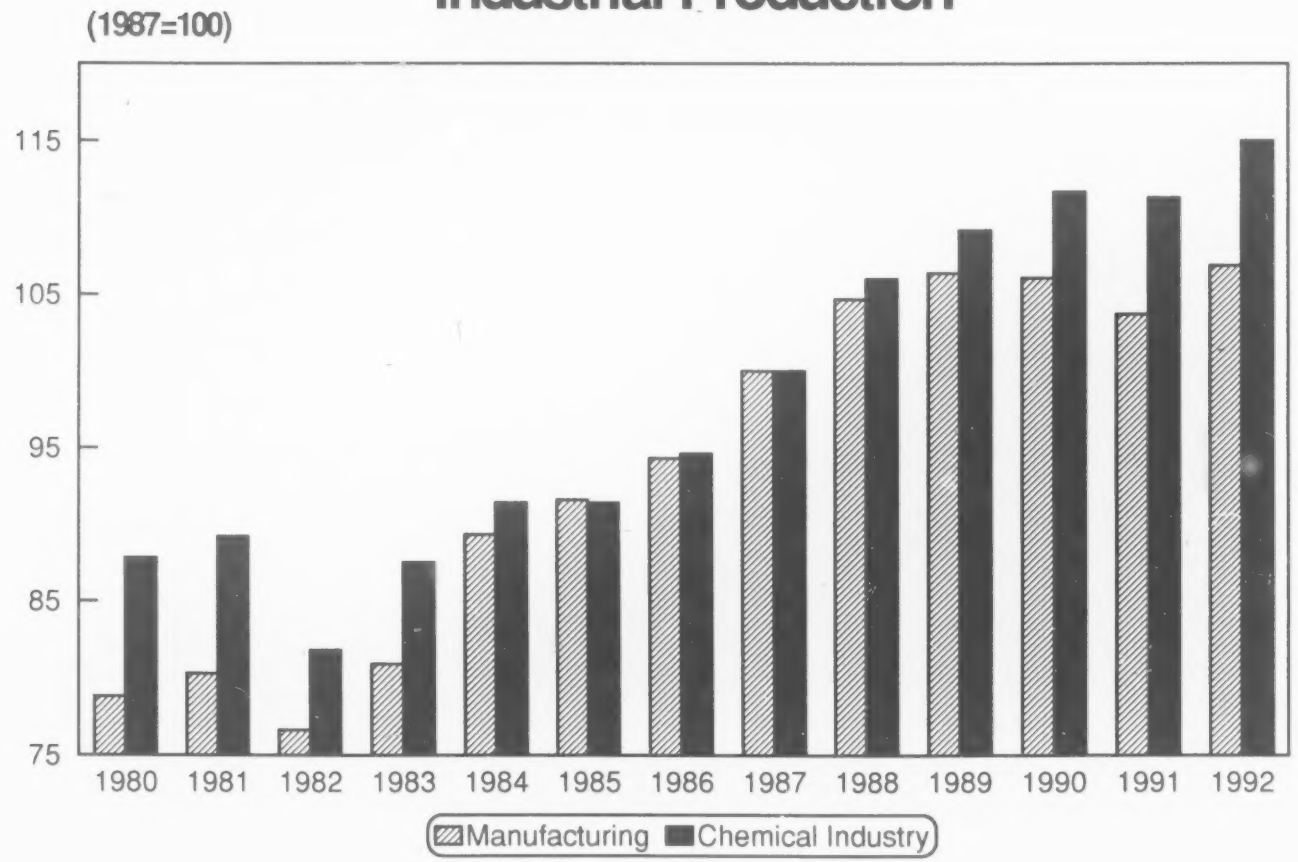
	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Manufacturing	n/a	725.4	711.1	733.8	791.4	810.5	819.1	877.8	924.6	932.4	922.8	n/a	n/a
Chemicals & Allied Products	n/a	57.5	63.8	68.1	66.4	67.0	74.8	82.3	83.2	84.1	88.0	n/a	n/a

Source: Bureau of Economic Analysis

Since the recession of the early 1980s, chemical industry production has expanded by 40 percent:

Chart 2.4

Industrial Production



Over the same period, the manufacturing sector as a whole has also increased production by 40 percent.

TABLE 2.4

VALUE ADDED BY MANUFACTURE *

(Billions of Dollars)	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Manufacturing:	n/a	773.83	824.12	881.99	983.23	1,000.14	1,035.44	1,166.56	1,262.41	1,307.96	1,326.36	1,313.83	n/a
Chemicals & Allied Products:	n/a	74.38	77.32	86.47	94.73	95.26	100.01	121.24	137.88	146.06	153.03	154.79	n/a
Industrial Inorganic Chemicals	n/a	8.77	8.83	9.21	10.42	11.09	10.97	11.23	12.84	14.53	16.10	15.72	n/a
Plastic Materials and Synthetics	n/a	9.76	9.40	12.40	13.68	12.20	14.15	17.82	20.76	21.29	20.51	19.67	n/a
Drugs	5.13	13.49	16.98	19.37	20.57	22.72	24.39	28.16	31.03	34.36	38.24	43.24	n/a
Soaps, Cleaners, and Toilet Goods	n/a	12.74	15.28	15.50	16.48	17.35	18.63	21.67	23.60	23.45	25.01	25.37	n/a
Paints and Allied Products	n/a	3.56	3.95	4.71	4.93	5.17	5.41	6.22	6.49	6.45	6.77	6.78	n/a
Industrial Organic Chemicals	5.20	15.70	12.34	14.51	15.99	14.87	14.72	21.53	26.99	29.42	28.81	26.44	n/a
Agricultural Chemicals	n/a	5.70	5.10	5.11	5.91	5.13	4.71	6.34	7.61	7.70	8.06	8.12	n/a
Miscellaneous Chemical Products	n/a	4.67	5.43	5.68	6.75	6.74	7.04	8.27	8.58	8.85	9.53	9.43	n/a

* Data after 1986 are not comparable to prior years because of definitional differences. Because the data include purchased services, they do not reflect a true value-added concept. True value added is equivalent to GDP by industry. (But also note that Table 2.3, "GDP by Industry", is in constant dollars, whereas this table shows current dollars.)

Source: Bureau of the Census

TABLE 2.5

INDUSTRY SHIPMENTS

(Billions of Dollars)	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Manufacturing:	633.7	1,852.7	1,960.2	2,070.6	2,288.2	2,334.5	2,335.9	2,475.9	2,682.5	2,792.7	2,873.5	2,821.7	2,930.0	4.1%	3.4%	3.8%
Chemicals & Allied Products:	49.2	168.2	176.3	189.6	206.0	204.8	205.7	229.5	259.7	278.1	288.2	289.0	297.1	5.4%	5.3%	2.8%
By Segment:																
Industrial Chemicals, Except Pigments	26.8	101.7	100.1	109.1	119.4	114.7	112.2	126.2	145.5	156.2	157.3	152.3	154.3	4.4%	4.1%	1.3%
Drugs, Soap, and Toiletries	15.1	41.9	50.7	54.6	57.7	61.3	66.4	74.0	81.8	88.0	95.2	101.9	109.3	8.0%	8.1%	7.3%
Other Chemical Products	7.3	24.6	25.4	25.8	28.8	28.8	27.1	29.4	32.4	33.9	35.8	34.8	33.5	2.8%	2.7%	-3.8%
By Use:																
Final Shipments	36.7	122.5	131.1	143.0	156.0	152.6	152.2	170.2	192.4	208.4	216.3	217.8	224.5	5.5%	5.7%	3.1%
Intra-Industry Shipments	12.5	45.7	45.2	46.6	50.0	52.2	53.5	59.3	67.3	69.6	71.9	71.2	72.7	4.9%	4.1%	2.0%
As a % of Total:																
Industrial Chemicals, Except Pigments	54.5%	60.5%	56.8%	57.6%	58.0%	56.0%	54.5%	55.0%	56.0%	56.2%	54.6%	52.7%	51.9%			
Drugs, Soap, and Toiletries	30.6%	24.9%	28.8%	28.8%	28.0%	29.9%	32.3%	32.2%	31.5%	31.6%	33.0%	35.3%	36.8%			
Other Chemical Products	14.8%	14.6%	14.4%	13.6%	14.0%	14.1%	13.2%	12.8%	12.5%	12.2%	12.4%	12.1%	11.3%			
Final Shipments	74.7%	72.8%	74.4%	75.4%	75.7%	74.5%	74.0%	74.2%	74.1%	75.0%	75.0%	75.4%	75.5%			
Intra-Industry Shipments	25.3%	27.2%	25.6%	24.6%	24.3%	25.5%	26.0%	25.8%	25.9%	25.0%	25.0%	24.6%	24.5%			

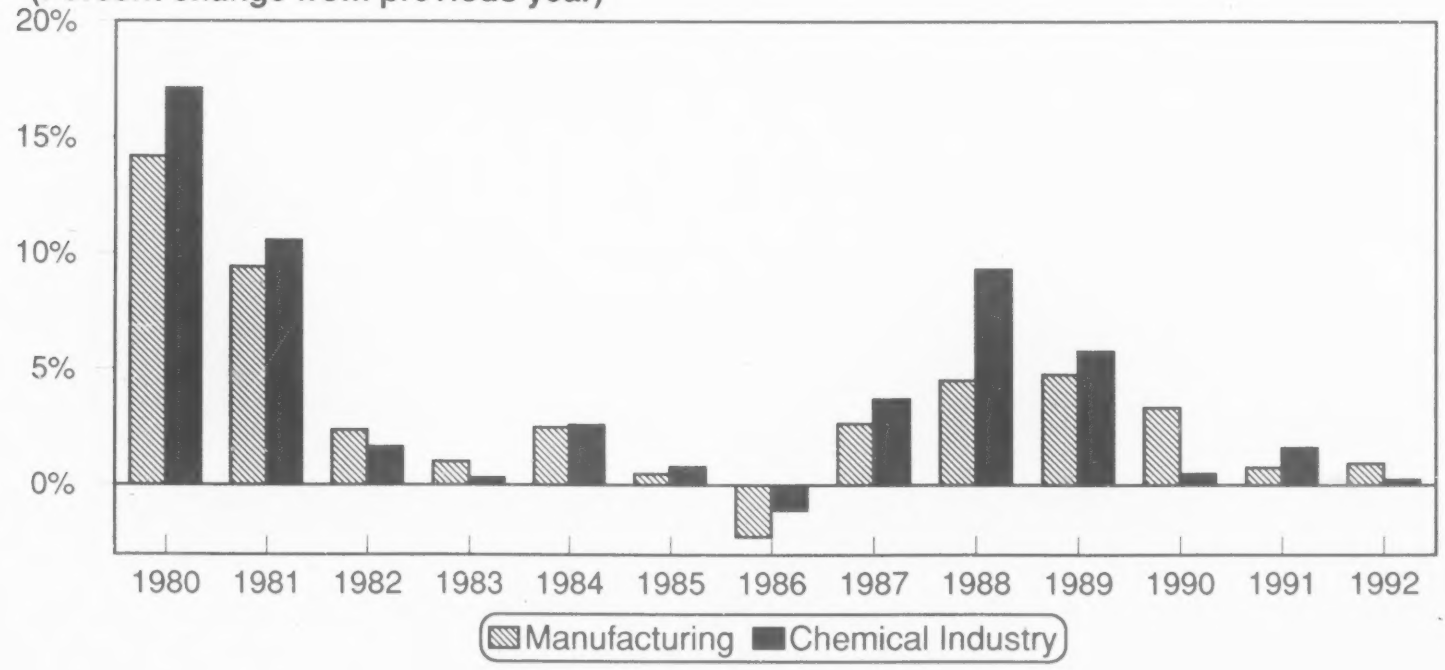
Sources: Bureau of the Census, CMA analysis

Prices for chemicals (like prices for all manufactured goods) have been increasing less rapidly in recent years:

Chart 2.5

Producer Prices

(Percent change from previous year)



From 1980 to 1992, chemical prices rose at an average annual rate of 3.0 percent. Prices for all manufactured goods together rose at an average annual rate of 2.5 percent over the same period.

TABLE 2.6

INVENTORIES (Millions of Dollars)	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Manufacturing	101,246	261,700	307,212	307,675	334,236	329,555	317,567	332,619	361,477	380,480	392,493	379,926	372,815	2.0%	2.3%	-1.9%
Chemicals & Allied Products:	6,802	19,899	24,278	24,532	26,238	25,952	25,558	26,388	29,372	30,831	33,194	33,867	35,118	3.8%	5.9%	3.7%
By Industry Segment:																
Industrial Chemicals, Except Pigments	3,514	10,745	13,717	13,833	14,644	13,995	13,505	13,737	15,268	16,143	17,620	17,411	17,510	2.5%	5.0%	0.6%
Drugs, Soap, and Toiletries	2,017	5,901	6,724	6,929	7,574	7,826	8,250	8,860	9,898	10,314	10,969	11,732	12,787	6.6%	7.6%	9.0%
Other Chemical Products	1,271	3,253	3,837	3,770	4,020	4,131	3,803	3,791	4,206	4,374	4,605	4,724	4,821	2.3%	4.9%	2.1%
By Type:																
Materials and Supplies	2,373	8,031	8,552	8,881	8,930	8,828	8,971	9,338	10,305	10,735	11,520	11,631	11,908	3.4%	5.0%	2.4%
Work in Progress	977	3,278	4,126	4,001	4,223	4,086	3,864	3,980	4,322	4,556	4,886	5,210	5,528	3.0%	6.8%	6.1%
Finished Goods	3,452	8,590	11,600	11,650	13,085	13,038	12,723	13,070	14,745	15,540	16,788	17,026	17,682	4.3%	6.2%	3.9%

Source: Bureau of the Census

TABLE 2.7

PRODUCER PRICE INDICES (1982=100)	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Manufacturing	37.7	89.3	100.0	101.0	103.5	104.0	101.7	104.4	109.1	114.3	118.1	119.0	120.1	1.8%	2.8%	0.9%
Chemicals & Allied Products:	35.0	89.0	100.0	100.3	102.9	103.7	102.6	106.4	116.3	123.0	123.6	125.6	125.9	2.3%	3.4%	0.2%
Industrial Chemicals:	28.6	91.9	100.0	97.3	96.8	96.0	91.5	95.5	106.8	114.8	113.2	111.8	109.2	0.9%	2.7%	-2.3%
Inorganic Chemicals	n/a	77.6	100.0	95.1	94.3	96.7	95.2	94.5	100.9	108.9	111.7	112.5	109.7	0.9%	3.0%	-2.5%
Organic Chemicals	n/a	98.7	100.0	98.2	97.8	95.4	89.3	95.0	108.2	116.2	112.9	110.6	108.1	0.8%	2.6%	-2.3%
Plastic Resins and Materials	32.0	98.5	100.0	102.4	108.9	107.5	104.4	110.3	132.4	133.4	124.1	120.0	116.4	1.5%	1.1%	-3.0%
Drugs and Pharmaceuticals	48.1	83.1	100.0	107.7	114.2	122.2	129.9	139.1	148.4	160.0	170.8	182.6	192.2	6.8%	6.7%	5.3%
Agricultural Chemicals	30.3	87.9	100.0	96.0	97.4	96.2	94.2	96.4	104.5	108.7	107.4	111.7	110.3	1.0%	2.7%	-1.3%
Other Chemicals & Allied Products	40.2	83.1	100.0	101.3	102.7	105.2	105.8	107.0	111.9	117.3	118.9	121.5	123.3	2.1%	2.9%	1.5%

Source: Bureau of Labor Statistics

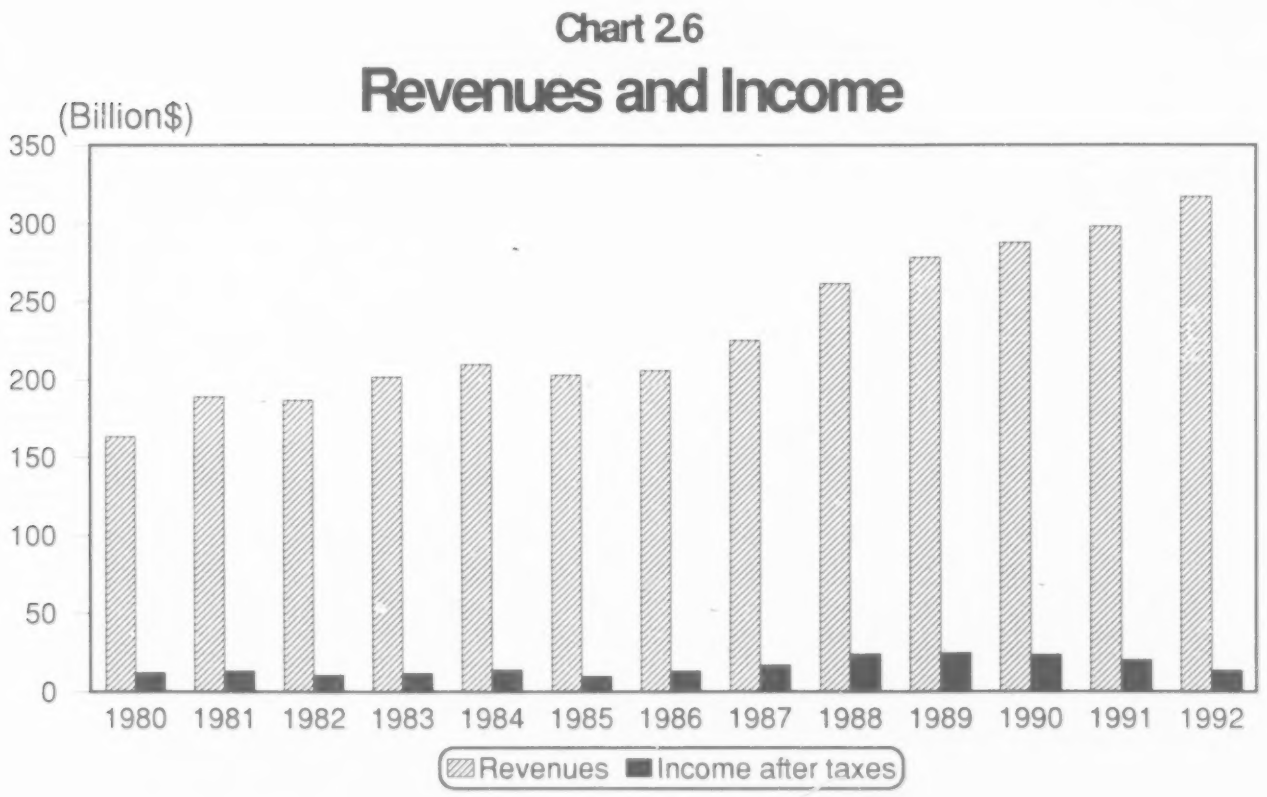
TABLE 2.8

CORPORATE PROFITS * (Billions of Dollars)	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Manufacturing	27.1	75.8	63.1	71.4	86.8	80.1	59.0	87.1	117.5	108.0	106.9	89.3	113.8	6.1%	5.5%	27.4%
Chemicals & Allied Products	3.9	5.5	4.7	6.8	7.3	6.0	8.0	15.1	19.3	18.5	16.2	16.1	18.1	14.4%	3.7%	12.4%

* (with inventory valuation adjustment)
Source: Bureau of Economic Analysis

The chemical industry's total revenues increased at an average annual rate of 5.4 percent between 1982 and 1992:

Chart 2.6



The industry's income after taxes has been falling in recent years. Reflecting accounting changes, its return on sales (after-tax income as a share of total revenue) was only 4.2 percent in 1992.

TABLE 2.9

CHEMICAL INDUSTRY: REVENUES & INCOME

(Billions of Dollars)	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Revenues:	n/a	163.15	186.38	201.32	209.63	202.80	205.78	225.20	261.62	278.30	287.46	297.84	316.79	5.4%	7.1%	6.4%
Depreciation and Amortization	n/a	5.96	7.94	8.59	8.94	9.20	10.02	9.91	11.03	12.10	12.94	13.69	14.82	6.4%	8.4%	8.3%
Other Operating Costs and Expenses	n/a	143.19	166.51	178.27	183.73	180.41	180.25	195.99	225.36	240.44	248.91	260.77	277.74	5.2%	7.2%	6.5%
Income (or Loss) from Operations:	n/a	14.01	11.92	14.47	16.96	13.20	15.50	19.30	25.23	25.76	25.61	23.39	24.23	7.3%	4.7%	3.6%
Nonoperating Income	n/a	3.07	2.15	2.24	2.86	0.39	4.56	6.27	8.32	8.13	7.25	4.58	7.01	12.5%	2.3%	53.3%
Income Before Income Taxes	n/a	17.08	14.07	16.70	19.82	13.59	20.06	25.57	33.55	33.89	32.85	27.96	17.22	2.0%	-7.6%	-38.4%
Income Taxes	n/a	5.32	3.75	5.06	5.94	4.05	7.16	9.01	9.90	9.37	9.43	7.96	3.97	0.6%	-15.1%	-50.2%
Income After Taxes	n/a	11.76	10.32	11.64	13.88	9.54	12.90	16.56	23.66	24.52	23.42	20.00	13.25	2.5%	-4.4%	-33.8%
Taxes as a % of Pre-Tax Income	n/a	31.1%	26.6%	30.3%	30.0%	29.8%	35.7%	35.2%	29.5%	27.6%	28.7%	28.5%	23.0%			

Source: Bureau of the Census

According to the Census Bureau, the chemical industry paid $4.0 billion in income taxes in 1992, 23 percent of the industry's pre-tax income.

Reflecting FASB Statement 106 (Employer's Accounting for Post-Retirement Benefits Other than Pensions) and other one-time accounting changes, the chemical industry's after-tax profit figure for 1992 was revised downward from the previously-reported $23.0 billion to $13.2 billion.

TABLE 2.10

CHEMICAL INDUSTRY: TOTAL ASSETS

(Billions of Dollars)	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Total Assets:	n/a	148.90	182.00	187.57	193.09	205.34	217.17	244.45	277.58	293.32	325.37	357.67	384.49	7.8%	9.5%	7.5%
Total Current Assets:	n/a	57.84	65.12	68.27	70.85	74.04	75.68	85.92	96.95	99.41	104.16	107.75	112.96	5.7%	5.6%	4.8%
Cash and Securities	n/a	5.36	7.03	8.19	9.13	9.84	11.03	11.45	12.89	12.41	11.21	14.62	13.88	7.0%	3.9%	-5.0%
Receivables	n/a	24.11	25.14	27.41	26.89	28.40	27.65	32.90	37.61	39.10	41.26	41.42	42.53	5.4%	5.3%	2.7%
Inventories	n/a	24.15	27.10	26.97	28.26	28.61	28.09	31.27	34.73	35.69	37.51	38.20	39.36	3.8%	4.7%	3.0%
Other Current Assets	n/a	4.22	5.86	5.71	6.57	7.19	8.92	10.31	11.72	12.21	14.18	13.51	17.19	11.4%	10.8%	27.2%
Net Property, Plant & Equipment:	n/a	58.79	76.81	78.28	77.28	77.17	77.55	82.77	92.84	100.22	114.59	129.79	142.54	6.4%	11.5%	9.8%
Depreciable & Amortizable Fixed Assets (+)	n/a	99.89	122.05	128.26	133.36	137.20	138.69	149.42	160.45	175.43	191.64	217.97	240.00	7.0%	9.9%	10.1%
Land and Mineral Rights (+)	n/a	4.72	7.93	7.87	6.78	6.35	6.21	6.30	9.04	7.44	12.62	13.03	13.44	5.4%	16.4%	3.2%
Accumulated Depreciation & Amortization(-)	n/a	45.82	53.17	57.85	62.86	66.38	67.35	72.95	76.66	82.65	89.68	100.92	110.90	7.6%	8.7%	9.9%
Other Non-Current Assets	n/a	32.27	40.07	41.02	44.96	54.13	63.94	75.76	87.80	93.69	106.63	120.13	128.99	12.4%	11.2%	7.4%

Source: Bureau of the Census

TABLE 2.11

CHEMICAL INDUSTRY: LIABILITIES AND SHAREHOLDERS' EQUITY
(Millions of Dollars)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates 1992/82	1992/87	1992/91
Total Liabilities and Shareholders' Equity	n/a	148.9	182.0	187.6	193.1	205.3	217.2	244.4	277.6	293.3	325.4	357.7	384.5	7.8%	9.5%	7.5%
Total Liabilities	n/a	69.4	86.7	90.4	92.8	105.0	116.4	137.6	157.1	165.5	187.2	208.2	236.4	10.5%	11.4%	13.5%
Current Liabilities	n/a	31.7	36.4	40.9	44.8	50.2	50.9	60.4	67.6	73.6	77.9	80.1	90.0	9.5%	8.3%	12.3%
Long-Term Debt & Other Liabilities	n/a	37.7	50.3	49.5	48.0	54.8	65.5	77.1	89.5	91.9	109.2	128.0	146.4	11.3%	13.7%	14.3%
Shareholders' Equity	n/a	79.5	95.3	97.2	100.3	100.3	100.8	106.9	120.5	127.8	138.2	149.5	148.1	4.5%	6.7%	-0.9%

Source: Bureau of the Census

Shareholder equity grew at an average annual rate of 4.5 percent from 1982 to 1992, well below the 10.5 percent annual growth rate of liabilities.

TABLE 2.12

CHEMICAL INDUSTRY: FINANCIAL RATIOS

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Profitability:													
Operating Margin	n/a	8.6%	6.4%	7.2%	8.1%	6.5%	7.5%	8.6%	9.6%	9.3%	8.9%	7.9%	7.6%
Return on Sales	n/a	7.2%	5.5%	5.8%	6.6%	4.7%	6.3%	7.4%	9.0%	8.8%	8.1%	6.7%	4.2%
Return on Assets	n/a	7.9%	5.7%	6.2%	7.2%	4.6%	5.9%	6.8%	8.5%	8.4%	7.2%	5.6%	3.4%
Return on Equity	n/a	14.8%	10.8%	12.0%	13.8%	9.5%	12.8%	15.5%	19.6%	19.2%	16.9%	13.4%	8.9%
Solvency and Liquidity:													
Debt/Equity Ratio	n/a	0.87	0.91	0.93	0.92	1.05	1.15	1.29	1.30	1.30	1.35	1.39	1.60
Current Ratio	n/a	1.83	1.79	1.67	1.58	1.47	1.49	1.42	1.43	1.35	1.34	1.34	1.26
Quick Ratio	n/a	1.06	1.04	1.01	0.95	0.90	0.94	0.90	0.92	0.87	0.86	0.87	0.82
Debt Ratio	n/a	0.47	0.48	0.48	0.48	0.51	0.54	0.56	0.57	0.56	0.58	0.58	0.61
Working Capital Turnover	n/a	2.82	2.86	2.95	2.96	2.71	2.72	2.62	2.70	2.80	2.76	2.76	2.80
Fixed-Asset Turnover	n/a	2.78	2.43	2.57	2.71	2.63	2.65	2.72	2.82	2.78	2.51	2.29	2.22
Total-Asset Turnover	n/a	1.10	1.02	1.07	1.09	0.99	0.95	0.92	0.94	0.95	0.88	0.83	0.82

Source: Bureau of the Census, CMA analysis

TABLE 2.13

INORGANIC CHEMICALS PRODUCTION
(Thousands of Tons)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates 1992/82	1992/87	1992/91
Aluminum Sulfate	1,191	1,286	1,154	1,120	1,239	1,204	1,213	1,226	1,237	1,243	1,227	1,185	810	-3.5%	-8.0%	-31.6%
Caustic Soda (Sodium Hydroxide)	10,141	11,606	9,385	10,039	10,914	10,790	10,405	11,553	10,533	11,469	12,030	11,714	12,010	2.5%	0.8%	2.5%
Chlorine	9,764	11,421	9,176	9,864	10,700	10,402	10,442	11,078	11,257	11,413	11,809	11,421	11,140	2.0%	0.1%	-2.5%
Hydrochloric Acid	2,014	2,888	2,450	2,468	2,693	2,803	2,392	2,996	3,228	3,268	3,140	3,301	2,875	1.6%	-0.8%	-12.9%
Hydrogen Peroxide	61	116	108	117	139	144	152	153	168	204	238	254	290	10.4%	13.6%	14.2%
Phosphorus, Elemental	597	432	361	366	386	359	364	344	343	353	346	306	280	-2.5%	-4.0%	-8.5%
Soda Ash (Sodium Carbonate)	7,071	8,275	7,819	8,467	8,511	8,511	8,438	8,891	9,632	9,915	10,099	9,932	10,450	2.9%	3.3%	5.2%
Sodium Silicate, Anhydrous	628	786	654	710	685	692	791	952	812	873	816	870	900	3.1%	1.1%	3.4%
Sodium Sulfate	1,373	1,139	864	914	901	811	841	799	819	755	786	794	670	-2.5%	-3.5%	-15.6%
Sodium Tripolyphosphate	1,208	789	651	669	692	612	617	586	549	580	497	462	440	-3.8%	-5.6%	-4.8%
Sulfuric Acid	29,525	44,157	33,233	37,459	41,893	39,890	35,993	39,256	42,580	43,301	44,337	43,350	44,400	2.9%	2.5%	2.4%
Titanium Dioxide	655	727	660	760	835	864	924	968	1,022	1,101	1,077	1,095	1,295	7.0%	6.0%	18.3%

Source: Bureau of the Census

TABLE 2.14

ORGANIC CHEMICALS PRODUCTION
(Millions of Pounds)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Acetic Acid	1,932	2,977	2,748	2,807	2,619	2,897	2,728	3,246	3,159	3,294	3,751	3,615	3,600	2.7%	2.1%	-0.4%
Acetone	1,615	2,076	1,693	1,859	1,862	1,788	1,910	1,845	2,303	2,524	2,330	2,347	2,395	3.5%	5.4%	2.0%
Acrylonitrile	1,039	1,830	2,035	2,146	2,219	2,349	2,182	2,452	2,609	2,362	2,676	2,647	2,830	3.4%	2.9%	6.9%
Aniline	398	659	557	663	786	716	824	859	1,029	1,016	989	961	1,005	6.1%	3.2%	4.6%
Benzene	7,675	11,227	7,700	8,435	8,530	8,251	8,860	10,589	11,627	11,936	12,443	11,484	12,025	4.6%	2.6%	4.7%
Bisphenol A	202	530	480	643	762	949	956	1,000	1,340	1,242	1,150	1,219	1,215	9.7%	4.0%	-0.3%
Butadiene (1,3-)	3,101	2,799	1,915	2,353	2,827	2,340	2,546	2,931	3,169	3,121	3,088	3,054	3,175	5.2%	1.6%	4.0%
Caprolactum	500	910	793	976	1,027	1,089	1,109	1,156	1,261	1,307	1,379	1,284	1,375	5.7%	3.5%	7.1%
Chloroform	240	353	299	362	405	275	422	462	524	588	484	505	515	5.6%	2.2%	2.0%
Cumene	1,993	3,459	2,743	3,345	3,754	2,627	3,745	4,105	4,455	4,426	4,311	4,167	4,565	5.2%	2.1%	9.6%
Cyclohexane	1,841	1,964	1,275	1,656	1,994	1,657	2,070	2,276	2,297	2,273	2,461	2,307	2,205	5.6%	-0.6%	-4.4%
Diethylene Glycol	341	382	394	463	535	441	490	436	563	435	482	487	525	2.9%	3.8%	7.8%
Ethanolamines	264	376	416	468	504	537	543	627	608	667	727	657	695	5.3%	2.1%	5.8%
Ethyl Acetate	161	234	235	213	210	192	199	214	254	292	272	260	295	2.3%	6.6%	13.5%
Ethylbenzene	4,827	7,642	6,656	7,876	7,562	7,386	9,020	9,346	9,929	9,236	8,369	8,871	10,990	5.1%	3.3%	23.9%
Ethylene	18,089	28,667	24,501	28,680	31,383	29,847	32,859	34,951	37,204	34,988	36,467	39,955	40,410	5.1%	2.9%	1.1%
Ethylene Dichloride	7,460	11,108	7,619	11,506	10,710	12,101	12,940	12,197	13,028	13,383	13,850	13,713	15,925	7.7%	5.5%	16.1%
Ethylene Glycol	3,038	4,386	4,309	4,425	3,224	4,178	4,770	5,183	5,517	5,461	5,071	4,810	5,125	1.7%	-0.2%	6.5%
Ethylene Oxide	3,865	5,220	4,987	5,534	5,699	5,430	5,430	4,785	5,953	5,031	5,355	5,248	5,560	1.1%	3.0%	5.9%
Formaldehyde	4,427	5,555	4,817	5,465	5,815	5,606	5,549	5,733	6,280	5,893	6,720	6,612	6,975	3.8%	4.0%	5.5%
Isopropyl Alcohol	1,919	1,836	1,380	1,209	1,394	1,235	1,301	1,371	1,389	1,474	1,456	1,342	1,240	-1.1%	-2.0%	-7.6%
Maleic Anhydride	215	304	260	299	359	394	359	382	448	475	424	381	435	5.3%	2.6%	14.2%
Methanol	4,932	7,153	7,556	7,982	8,186	5,003	7,205	7,537	7,345	8,167	8,344	8,704	8,730	1.5%	3.0%	0.3%
Methyl-Tertiary-Butyl Ether (MTBE)	120	430	690	840	1,375	1,890	2,235	3,514	5,680	8,227	8,884	8,502	7,665	27.2%	16.9%	-9.8%
Methyl Chloride	423	362	366	409	482	415	605	373	428	461	772	916	930	9.8%	20.0%	1.5%
Methyl Chloroform	366	692	595	586	675	869	652	694	724	783	803	644	720	1.9%	0.7%	11.8%
Methyl Ethyl Ketone	480	587	468	531	543	537	600	672	482	450	465	513	495	0.6%	-5.9%	-3.5%
Methyl Methacrylate	445	780	721	844	917	858	943	1,029	1,100	1,161	1,182	1,102	835	1.5%	-4.1%	-24.2%
Methylene Chloride	402	564	532	584	607	467	566	516	504	482	461	389	360	-3.8%	-6.9%	-7.5%
Perchloroethylene	707	765	585	547	573	678	414	473	498	481	372	239	245	-8.3%	-12.3%	2.5%
Phenol	1,708	2,568	2,175	2,638	2,889	2,841	3,115	3,841	3,562	3,806	3,538	3,597	3,705	5.5%	-0.7%	3.0%
Phthalic Anhydride	734	818	684	838	870	820	864	1,035	999	917	940	587	900	2.8%	-2.8%	53.3%
Propylene	6,641	13,675	12,535	13,959	15,559	14,887	16,522	19,019	21,224	20,572	21,846	21,549	22,595	6.1%	3.5%	4.9%
Propylene Glycol	428	488	400	484	462	500	573	747	840	805	754	666	730	6.2%	-0.5%	9.6%
Propylene Oxide	1,179	1,767	1,470	1,570	1,785	2,375	2,450	2,570	3,000	3,030	2,965	2,905	3,105	7.8%	3.9%	6.9%
Styrene	4,335	6,856	5,942	6,802	7,709	7,622	7,888	8,014	8,984	8,337	8,017	8,114	8,940	4.2%	2.2%	10.2%
Terephthalic Acid, Dimethyl Ester	1,447	6,054	4,843	5,626	5,912	6,490	6,257	7,601	10,234	8,426	7,773	7,641	5,640	1.5%	-5.8%	-26.2%
Toluene	4,612	5,624	4,162	4,393	4,463	4,008	4,408	6,206	6,299	5,809	6,210	6,297	6,035	3.8%	-0.6%	-4.2%
Vinyl Acetate	803	1,921	1,876	1,963	2,024	2,112	1,710	1,813	2,561	2,553	2,659	2,732	2,655	3.5%	7.9%	-2.8%
Vinyl Chloride	4,040	6,466	4,902	6,875	6,085	9,463	8,439	8,402	9,058	10,135	10,624	8,873	13,225	10.4%	9.5%	49.0%
o-Xylene	799	995	802	781	688	675	788	940	971	983	943	766	920	1.4%	-0.4%	20.1%
p-Xylene	1,590	4,238	3,391	4,114	4,264	4,779	5,035	5,155	5,601	5,345	5,200	5,350	5,655	5.2%	1.9%	5.7%

Source: United States International Trade Commission, CMA estimates

TABLE 2.15

INDUSTRIAL GASES PRODUCTION
(Millions of Cubic Feet)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Acetylene	14,834	5,493	3,824	3,901	4,974	4,972	4,971	5,284	5,297	5,445	5,507	5,603	5,320	3.4%	0.1%	-5.1%
Hydrogen	59,654	106,562	88,131	103,354	112,790	121,243	136,478	149,217	177,008	145,544	147,840	152,183	163,000	6.3%	1.8%	7.1%
Nitrogen	151,191	479,240	482,726	560,124	651,654	603,707	677,474	675,843	722,013	744,068	749,525	758,823	810,285	5.3%	3.7%	6.8%
Oxygen	329,729	430,977	348,814	345,881	386,615	356,511	383,267	402,644	451,999	451,802	462,293	472,215	511,950	3.9%	4.9%	8.4%

Source: Bureau of the Census

TABLE 2.16

INORGANIC FERTILIZER PRODUCTION
(Thousands of Tons)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Ammonia, Synthetic Anhydrous	13,824	19,653	15,081	13,952	16,702	17,319	14,488	16,098	16,821	16,468	16,796	17,167	17,975	1.8%	2.2%	4.7%
Ammonium Nitrate	6,456	9,127	7,091	6,240	7,165	7,149	6,091	6,547	7,504	7,871	7,081	7,777	7,665	0.8%	3.2%	-1.4%
Ammonium Sulfate	1,894	2,136	1,769	1,956	2,067	2,093	2,080	2,189	2,333	2,384	2,539	2,243	2,360	2.9%	1.5%	5.2%
Nitric Acid	7,603	9,232	7,390	6,968	7,798	7,645	6,736	7,225	7,991	8,349	7,999	7,925	8,040	0.8%	2.2%	1.5%
Nitrogen Solutions	1,721	2,773	2,786	2,605	2,894	2,656	2,275	2,385	2,902	2,913	2,853	3,208	3,450	2.2%	7.7%	7.5%
Phosphoric Acid	5,683	10,848	8,253	9,767	11,394	10,607	9,578	10,599	11,659	11,737	12,034	12,056	12,680	4.4%	3.7%	5.2%
Urea	3,119	7,830	6,470	6,137	7,752	6,974	6,264	7,433	7,914	8,004	8,120	8,133	8,420	2.7%	2.5%	3.5%

Source: Bureau of the Census

TABLE 2.17

TOP 50 CHEMICALS PRODUCED IN THE UNITED STATES, 1992
(Thousands of Tons)

Rank	Chemical	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
1	Sulfuric Acid	29,525	44,157	33,233	37,459	41,893	39,890	35,993	39,256	42,580	43,301	44,337	43,350	44,400	2.9%	2.5%	2.4%
2	Nitrogen	5,478	17,364	17,490	20,295	23,611	21,874	24,547	24,487	26,160	26,959	27,157	27,494	29,359	5.3%	3.7%	6.8%
3	Ethylene	9,045	14,334	12,251	14,340	15,692	14,924	16,430	17,476	18,602	17,494	18,234	19,978	20,205	5.1%	2.9%	1.1%
4	Oxygen	11,947	15,615	12,638	12,532	14,008	12,917	13,887	14,589	16,377	16,370	16,750	17,110	18,549	3.9%	4.9%	8.4%
5	Ammonia, Synthetic Anhydrous	13,824	19,653	15,081	13,952	16,702	17,319	14,488	16,098	16,821	16,468	16,796	17,167	17,975	1.8%	2.2%	4.7%
6	Phosphoric Acid	5,683	10,848	8,253	9,767	11,394	10,607	9,578	10,599	11,659	11,737	12,034	12,056	12,680	4.4%	3.7%	5.2%
7	Caustic Soda (Sodium Hydroxide)	10,141	11,606	9,385	10,039	10,914	10,790	10,405	11,553	10,533	11,469	12,030	11,714	12,010	2.5%	0.8%	2.5%
8	Propylene	3,321	6,838	6,268	6,980	7,780	7,444	8,261	9,510	10,612	10,286	10,923	10,775	11,298	6.1%	3.5%	4.9%
9	Chlorine	9,764	11,421	9,176	9,864	10,700	10,402	10,442	11,078	11,257	11,413	11,809	11,421	11,140	2.0%	0.1%	-2.5%
10	Soda Ash (Sodium Carbonate)	7,071	8,275	7,819	8,467	8,511	8,511	8,438	8,891	9,632	9,915	10,099	9,932	10,450	2.9%	3.3%	5.2%
11	Urea	3,119	7,830	6,470	6,137	7,752	6,974	6,264	7,433	7,914	8,004	8,120	8,133	8,420	2.7%	2.5%	3.5%
12	Nitric Acid	7,603	9,232	7,390	6,968	7,798	7,645	6,736	7,225	7,991	8,349	7,999	7,925	8,040	0.8%	2.2%	1.5%
13	Ethylene Dichloride	3,730	5,554	3,810	5,753	5,355	6,051	6,470	6,099	6,514	6,692	6,925	6,857	7,963	7.7%	5.5%	16.1%
14	Ammonium Nitrate	6,456	9,127	7,091	6,240	7,165	7,149	6,091	6,547	7,504	7,871	7,081	7,777	7,665	0.8%	3.2%	-1.4%
15	Vinyl Chloride	2,020	3,233	2,451	3,438	3,043	4,732	4,220	4,201	4,529	5,068	5,312	4,437	6,613	10.4%	9.5%	49.0%
16	Benzene	3,838	5,614	3,850	4,218	4,265	4,126	4,430	5,295	5,814	5,968	6,222	5,742	6,013	4.6%	2.6%	4.7%
17	Hydrogen	2,161	3,861	3,193	3,745	4,087	4,393	4,945	5,407	6,413	5,273	5,357	5,514	5,906	6.3%	1.8%	7.1%
18	Ethylbenzene	2,414	3,821	3,328	3,938	3,781	3,693	4,510	4,673	4,965	4,618	4,185	4,436	5,495	5.1%	3.3%	23.9%
19	Carbon Dioxide	1,135	3,720	3,682	3,880	4,315	4,623	4,775	4,731	5,058	5,339	5,186	4,880	5,250	3.6%	2.1%	7.6%
20	Styrene	2,168	3,428	2,971	3,401	3,855	3,811	3,944	4,007	4,492	4,169	4,009	4,057	4,470	4.2%	2.2%	10.2%
21	Methanol	2,466	3,577	3,778	3,991	4,093	2,502	3,603	3,769	3,673	4,084	4,172	4,352	4,365	1.5%	3.0%	0.3%
22	Methyl Tertiary-Butyl Ether (MTBE)	60	215	345	420	688	945	1,118	1,757	2,840	4,114	4,442	4,251	3,833	27.2%	16.9%	-9.8%
23	Formaldehyde	2,214	2,778	2,409	2,733	2,908	2,803	2,775	2,867	3,140	2,947	3,360	3,306	3,488	3.8%	4.0%	5.5%
24	Nitrogen Solutions	1,721	2,773	2,786	2,605	2,894	2,656	2,275	2,385	2,902	2,913	2,853	3,208	3,450	2.2%	7.7%	7.5%
25	Toluene	2,306	2,812	2,081	2,197	2,232	2,004	2,204	3,103	3,150	2,905	3,105	3,149	3,018	3.8%	-0.6%	-4.2%
26	Hydrochloric Acid	2,014	2,888	2,450	2,468	2,693	2,803	2,392	2,996	3,228	3,268	3,140	3,301	2,875	1.6%	-0.8%	-12.9%
27	p-Xylene	795	2,119	1,696	2,057	2,132	2,390	2,518	2,578	2,801	2,673	2,600	2,675	2,828	5.2%	1.9%	5.7%
28	Terephthalic Acid, Dimethyl Ester	724	3,027	2,422	2,813	2,956	3,245	3,129	3,801	5,117	4,213	3,887	3,821	2,820	1.5%	-5.8%	-26.2%
29	Ethylene Oxide	1,933	2,610	2,494	2,767	2,850	2,715	2,715	2,393	2,977	2,516	2,678	2,624	2,780	1.1%	3.0%	5.9%
30	Ethylene Glycol	1,519	2,193	2,155	2,213	1,612	2,089	2,385	2,592	2,759	2,731	2,536	2,405	2,563	1.7%	-0.2%	6.5%
31	Ammonium Sulfate	1,894	2,136	1,769	1,956	2,067	2,093	2,080	2,189	2,333	2,384	2,539	2,243	2,360	2.9%	1.5%	5.2%
32	Cumene	997	1,730	1,372	1,673	1,877	1,314	1,873	2,053	2,228	2,213	2,156	2,084	2,283	5.2%	2.1%	9.6%
33	Phenol	854	1,284	1,088	1,319	1,445	1,421	1,558	1,921	1,781	1,903	1,769	1,799	1,853	5.5%	-0.7%	3.0%
34	Acetic Acid	966	1,489	1,374	1,404	1,310	1,449	1,364	1,623	1,580	1,647	1,876	1,808	1,800	2.7%	2.1%	-0.4%
35	Butadiene (1,3-)	1,551	1,400	958	1,177	1,414	1,170	1,273	1,466	1,585	1,561	1,544	1,527	1,588	5.2%	1.6%	4.0%
36	Propylene Oxide	590	884	735	785	893	1,188	1,225	1,285	1,500	1,515	1,483	1,453	1,553	7.8%	3.9%	6.9%
37	Carbon Black	1,466	1,310	1,170	1,270	1,470	1,290	1,300	1,370	1,450	1,465	1,440	1,350	1,505	2.5%	1.9%	11.5%
38	Acrylonitrile	520	915	1,018	1,073	1,110	1,175	1,091	1,226	1,305	1,181	1,338	1,324	1,415	3.4%	2.9%	6.9%
39	Vinyl Acetate	402	961	938	982	1,012	1,056	855	907	1,281	1,277	1,330	1,366	1,328	3.5%	7.9%	-2.8%
40	Titanium Dioxide	655	727	660	760	835	864	924	968	1,022	1,101	1,077	1,095	1,295	7.0%	6.0%	18.3%
41	Acetone	808	1,038	847	930	931	894	955	923	1,152	1,262	1,165	1,174	1,198	3.5%	5.4%	2.0%
42	Cyclohexane	921	982	638	828	997	829	1,035	1,138	1,149	1,137	1,231	1,154	1,103	5.6%	-0.6%	-4.4%
43	Sodium Silicate, Anhydrous	628	786	664	710	685	692	791	952	812	873	816	870	900	3.1%	-1.1%	3.4%
44	Aluminum Sulfate	1,191	1,286	1,154	1,120	1,239	1,204	1,213	1,226	1,237	1,243	1,227	1,185	810	-3.5%	-8.0%	-31.6%
45	Caprolactum	250	455	397	488	514	545	555	578	631	654	690	642	688	5.7%	3.5%	7.1%
46	Sodium Sulfate	1,373	1,139	864	914	901	811	841	799	819	755	786	794	670	-2.5%	-3.5%	-15.6%
47	Isopropyl Alcohol	960	918	690	605	697	618	651	686	695	737	728	671	620	-1.1%	-2.0%	-7.6%
48	Bisphenol A	101	265	240	322	381	475	478	500	670	621	575	610	608	9.7%	4.0%	-0.3%
49	Aniline	199	330	279	332	393	358	412	430	515	508	495	481	503	6.1%	3.2%	4.6%
50	Methyl Chloride	212	181	183	205	241	208	303	187	214	231	386	458	465	9.8%	20.0%	1.5%

Section 3
U.S. International Trade

The increase in world chemical production has brought with it an even larger increase in international chemical trade. Most chemicals are now manufactured in many production locations around the globe. Prices for many chemicals are set by global supplies and global demand. World exports of chemicals were about $300 billion in 1991. World trade in chemicals reflects an intensely competitive struggle for markets by the producers in a globalized industry.

The U.S. chemical industry began a limited export trade in potash and naval stores with the United Kingdom as early as the 18th century. In 1992, exports of U.S.-produced chemicals reached $44 billion, about 15% of total world chemical exports, and an amount greater than total U.S. agricultural exports. The U.S. chemical industry competes in a global context and its share of international markets is increasingly in unique products in which it enjoys distinct technological advantages. Canada represents the largest single national market for U.S. chemical exports, followed by Japan. U.S. Chemical exports to Mexico, the industry's third-largest national export market, have grown 148% from 1986 to 1992. Western Europe, Latin America, and Asia are other large markets.

U.S. imports of chemicals have also increased, reaching $27 billion in 1992. Canada is by far the largest exporter of chemicals to the United States, about $4.9 billion in 1992. The U.S. chemical industry has traditionally maintained trade surpluses, even during the second half of the 1980s, a period when the overall U.S. deficit in merchandise trade was often over $100 billion per year. In 1992, the U.S. trade surplus in chemicals was $16.8 billion, including a $1.5 billion trade surplus with Japan.

The U.S. trade statistics in this section are compiled by the U.S. Department of Commerce and are presented in Standard International Trade Classification (SITC) Revision 3 format.

SITC 51 Organic Chemicals includes hydrocarbons and their derivatives, alcohols, phenols, and other organic compounds.

SITC 52 Inorganic Chemicals includes chlorine and other inorganic elements, acids, metallic salts and other inorganic compounds.

SITC 53 Dyeing, Tanning and Coloring includes dyes, color lakes, tanning extracts, paints, pigments, varnishes, inks and related preparations.

SITC 54 Medicinal and Pharmaceutical Products includes vitamins, antibiotics, hormones, veterinary and other medicaments and related preparations.

SITC 55 Essential Oils and Perfume Materials includes essential oils, perfume materials, perfumes, cosmetics, toilet preparations, polishes, soaps and related cleansing preparations.

SITC 56 Fertilizers includes nitrogenous, phosphatic and other chemical and mineral fertilizers.

SITC 57 Plastics in Primary Form includes polyethylene, PVC, polystyrene and other plastic resins.

SITC 58 Plastics in Non-Primary Form includes tubes, pipes, hoses, plates, sheets, film, foil, strips, and other shades of plastic.

SITC 59 Chemical Materials and Products, not elsewhere classified, includes pesticides, starches, glues, explosives and pyrotechnic products, fuel additives, plasticizers, textile specialities and other miscellaneous chemical products and preparations.

Exports shown in this section are domestic exports only, which do not include re-exports, valued free alongside ship (F.A.S.). Imports are imports for consumption at customs value. Imports for consumption do not include imports that are subsequently exported (re-exports) and is, therefore, comparable to domestic exports. In prior editions of this publication we reported general imports which include those imports which are subsequently re-exported. The use of domestic exports and general imports produces an artificially low trade balance by including this re-export trade in imports direction while ignoring it in exports. The customs import valuation however, does not include the cost of insurance and freight, which some consider a cost of the import.

For this section, "Eastern Europe" is defined as the following set of countries: Albania, Bulgaria, Czechoslovakia, Hungary, Poland, and Romania. "Western Europe" is defined as: all twelve members of the European Community, plus Austria, Cyprus, Finland, Gibraltar, Iceland, Malta, Norway, Sweden, Switzerland, Turkey, and former Yugoslavia.

The chemical industry's trade surplus grew after the dollar fell from its 1985 high:

Chart 3.1

U.S. Chemicals Trade

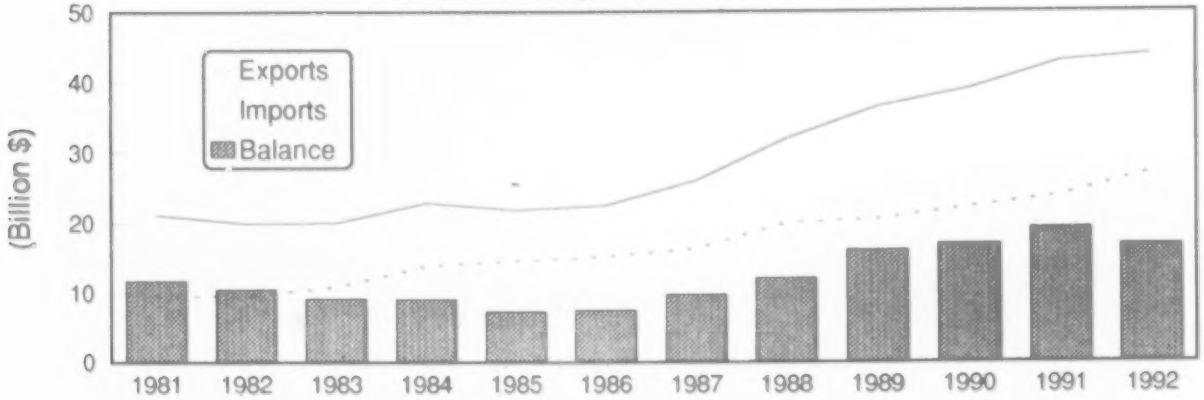
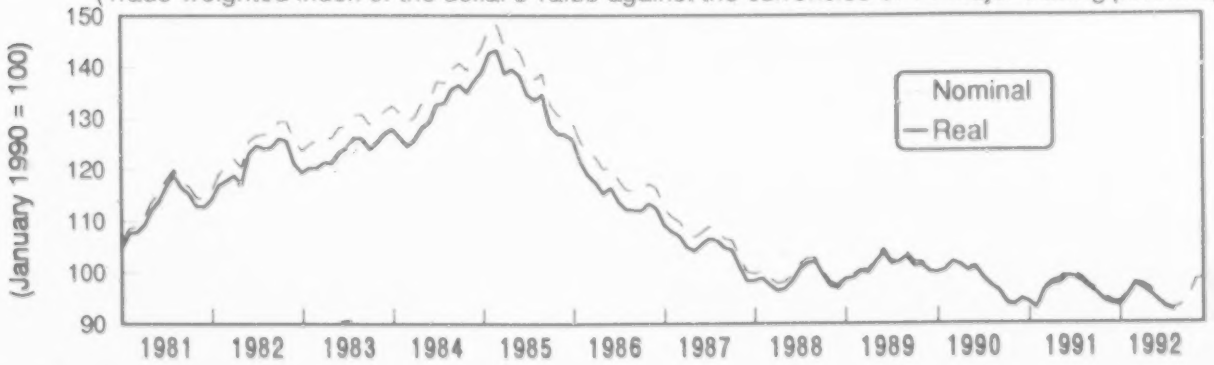


Chart 3.2

Index Value of the U.S. Dollar

(Trade-weighted index of the dollar's value against the currencies of 14 major trading partners)



Source: Commerce Department

Chemical exports rose by an average of 11.8% annually from 1986 to 1992. Also in 1992, chemical exports were $44 billion, higher than total U.S. agricultural exports. The foreign earnings of U.S. chemical companies and the chemical trade surplus added $23 billion to U.S. international accounts. By 1992, real and nominal values of the dollar were below 1981 levels.

TABLE 3.1

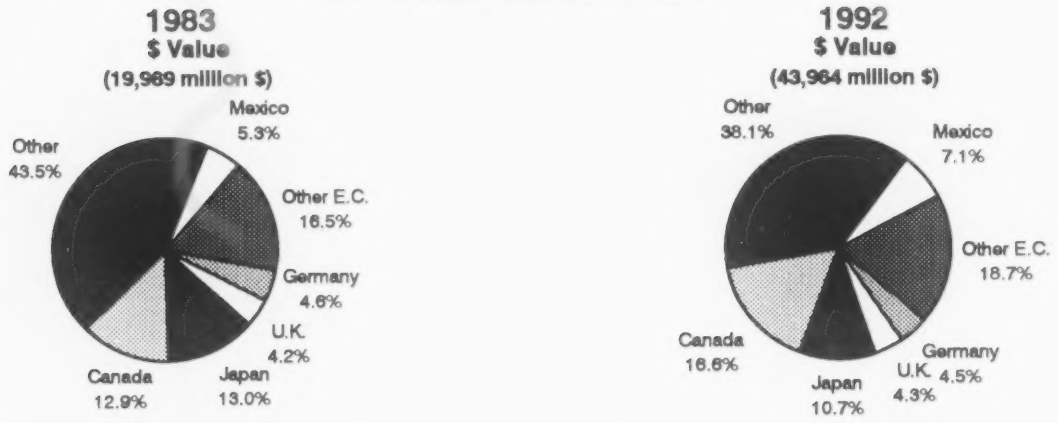
SUMMARY OF U.S. CHEMICAL TRADE
(Millions of Dollars)

		1983	Share in 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
5 Chemicals & Rel. Prod.	Exports	19,969	100.0%	22,833	21,831	22,524	26,026	31,911	36,489	38,989	42,974	43,964	100.0%	2.3%
	Imports	10,869	100.0%	13,820	14,590	15,129	16,369	19,911	20,519	22,173	23,808	27,214	100.0%	14.3%
	Balance	9,100		9,013	7,241	7,395	9,657	12,000	15,970	16,815	19,166	16,750		
51 Organic Chemicals	Exports	5,351	26.8%	6,114	5,999	6,425	7,720	9,707	10,613	10,405	10,936	11,001	25.0%	0.6%
	Imports	3,473	32.0%	4,306	4,713	4,823	5,461	7,034	6,952	7,222	7,917	9,042	33.2%	14.2%
	Balance	1,879		1,808	1,286	1,602	2,260	2,673	3,661	3,183	3,019	1,958		
52 Inorganic Chemicals	Exports	2,966	14.9%	3,506	3,625	3,683	3,789	4,289	4,319	3,816	4,102	4,119	9.4%	0.4%
	Imports	2,303	21.2%	3,107	3,023	2,930	2,662	3,142	3,228	3,230	3,292	3,286	12.1%	-0.2%
	Balance	663		399	602	753	1,127	1,147	1,091	586	810	833		
53 Dyeing & Coloring Mat.	Exports	715	3.6%	731	685	767	952	1,100	1,097	1,588	1,648	1,867	4.3%	13.4%
	Imports	642	5.9%	803	855	1,066	1,264	1,295	1,129	1,283	1,417	1,617	5.9%	14.1%
	Balance	73		-72	-170	-299	-311	-195	-32	305	230	250		
54 Pharmaceuticals	Exports	2,217	11.1%	2,316	2,418	2,662	2,718	3,262	3,660	4,103	4,606	5,357	12.2%	16.3%
	Imports	803	7.4%	1,025	1,127	1,223	1,503	1,824	2,085	2,555	3,103	3,895	14.3%	25.5%
	Balance	1,414		1,291	1,290	1,438	1,215	1,437	1,574	1,549	1,503	1,462		
55 Oils Perfumes & Cleansing	Exports	795	4.0%	813	772	809	951	1,126	1,469	1,963	2,361	2,631	6.0%	11.4%
	Imports	426	3.9%	595	702	823	893	1,065	1,042	1,167	1,272	1,529	5.6%	20.2%
	Balance	369		217	70	-13	59	61	427	796	1,089	1,102		
56 Fertilizers	Exports	1,332	6.7%	2,203	1,750	929	1,084	1,199	2,821	2,575	2,980	2,372	5.4%	-20.4%
	Imports	977	9.0%	1,119	945	837	768	991	999	955	919	952	3.5%	3.6%
	Balance	355		1,084	805	92	317	208	1,822	1,619	2,061	1,420		
57 Primary Plastics	Exports	2,737	13.7%	2,926	2,730	3,121	4,033	5,503	5,727	6,429	7,537	7,178	16.3%	-4.8%
	Imports	538	5.0%	774	852	992	1,102	1,357	1,677	1,968	1,922	2,241	8.2%	16.6%
	Balance	2,199		2,152	1,878	2,129	2,931	4,146	4,050	4,461	5,614	4,936		
58 Non-Primary Plastics	Exports	1,247	6.3%	1,374	1,272	1,387	1,660	2,001	2,202	2,633	2,786	3,076	7.0%	10.4%
	Imports	749	6.9%	945	994	1,146	1,294	1,558	1,628	1,775	1,851	2,042	7.5%	10.3%
	Balance	498		430	277	241	366	442	574	858	935	1,033		
59 Chemical Mat. & Prod. NES	Exports	2,602	13.1%	2,849	2,581	2,742	3,118	3,725	4,583	5,478	6,020	6,363	14.5%	5.7%
	Imports	957	8.8%	1,144	1,378	1,289	1,423	1,645	1,778	2,018	2,115	2,609	9.6%	23.4%
	Balance	1,651		1,705	1,203	1,453	1,695	2,080	2,804	3,459	3,905	3,754		

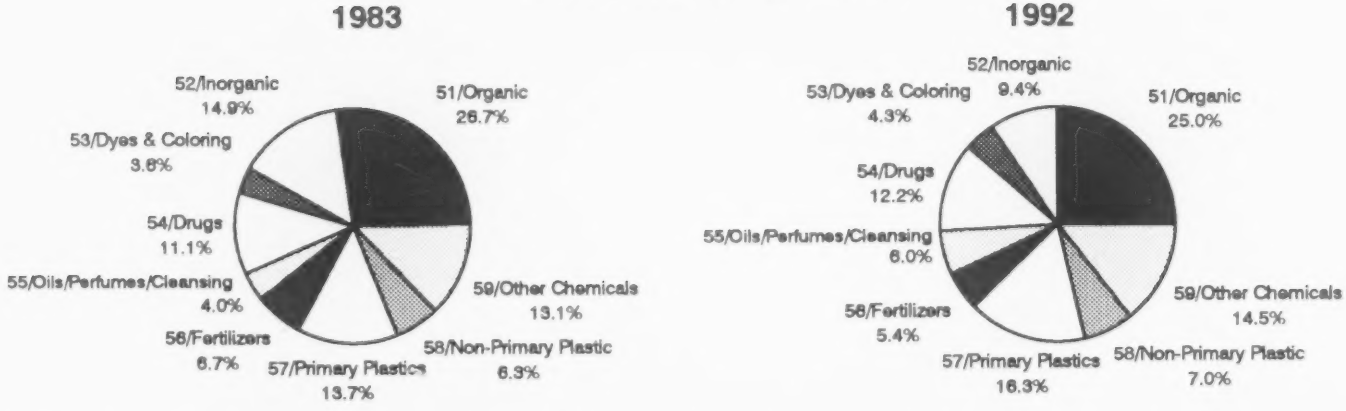
Source: U.S. Department of Commerce
SITC (Standard International Trade Code); Revision 3; Domestic Exports & Imports For Consumption

Chart 3.3
U.S. Exports
(Percent of Total)

Country of Destination



Product Composition



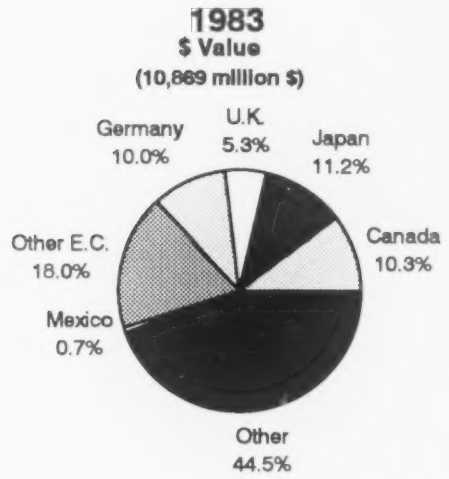
The European Community was the largest regional importer of U.S.-produced chemicals in 1993. Canada and Japan were the first and second largest individual country markets, respectively. Organic chemicals (SITC 51) is the largest export category, followed by plastics. The plastics share of chemical exports (SITC 57 and SITC 58) increased by 3.4 percentage points between 1983 and 1992.

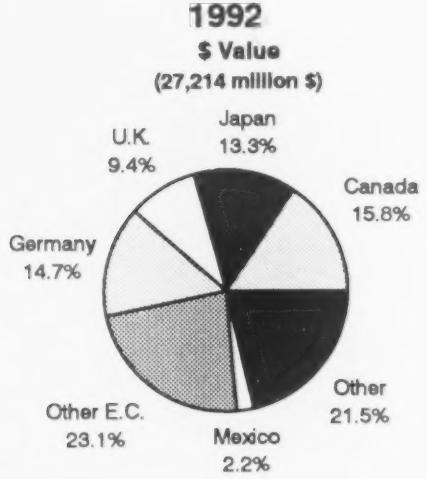
Chart 3.4

U.S. Imports

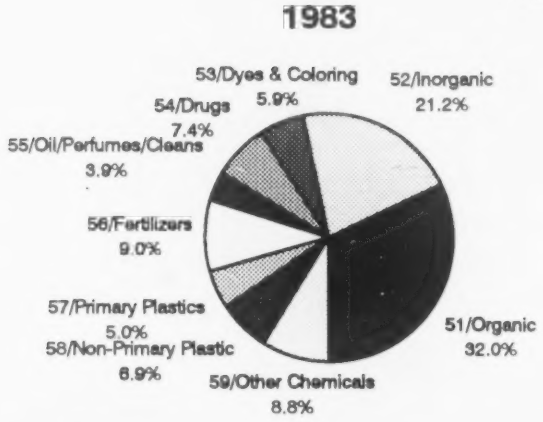
(Percent of Total)

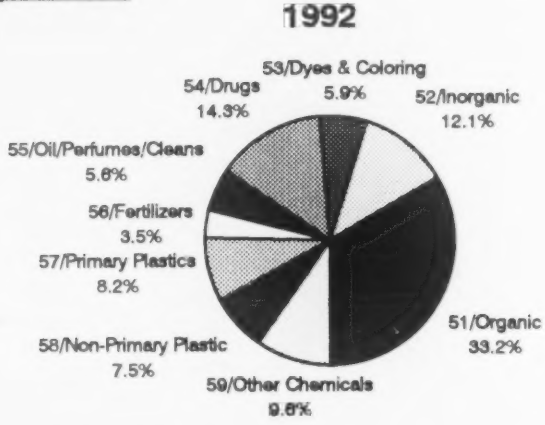
Country of Orgin





Product Composition

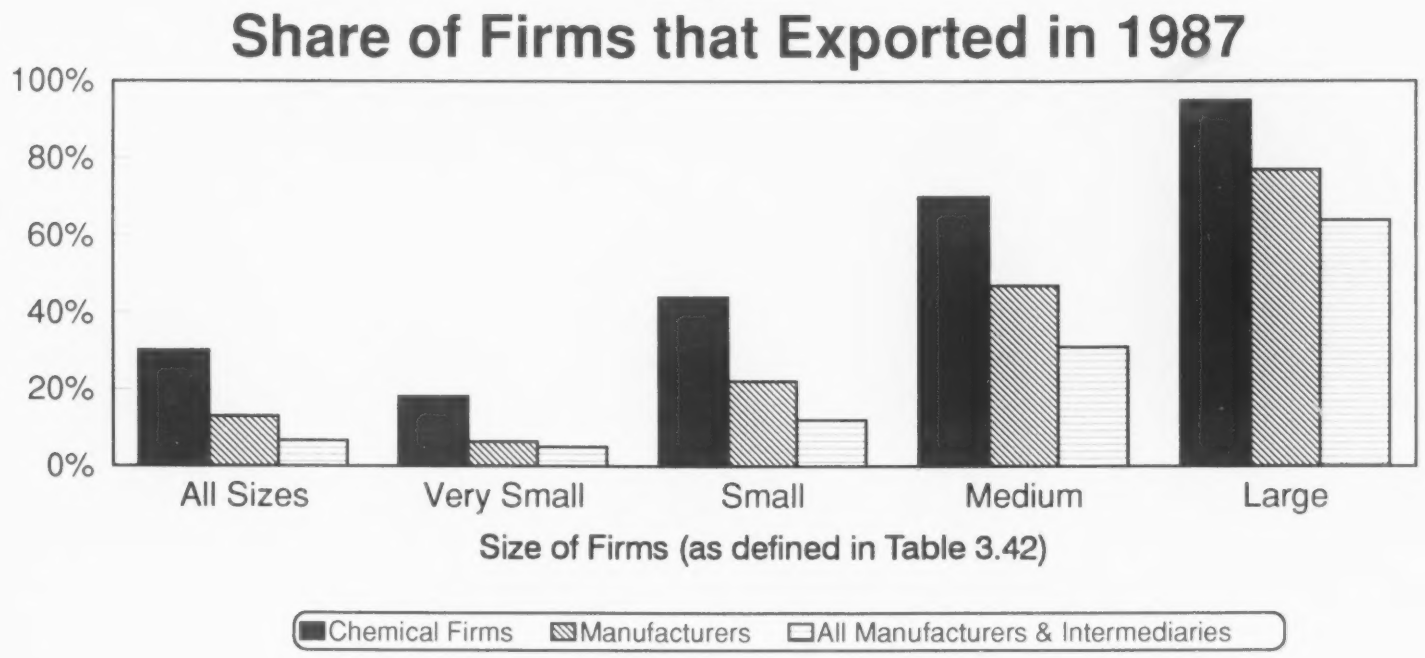




The European Community was also the largest regional exporter of chemicals to the U.S. in 1992. The U.S. chemical industry had positive trade balances with Canada and Mexico ($2.3 billion each), Taiwan (1.6 billion), Japan ($1.5 billion), and most other countries. The U.S. chemical industry had trade deficits, however, with Germany, Britain, France, and the countries of the former Soviet Union.

30 percent of all U.S. chemical companies exported in 1987 -- compared to 13 percent of companies in the manufacturing sector as a whole:

Chart 3.5



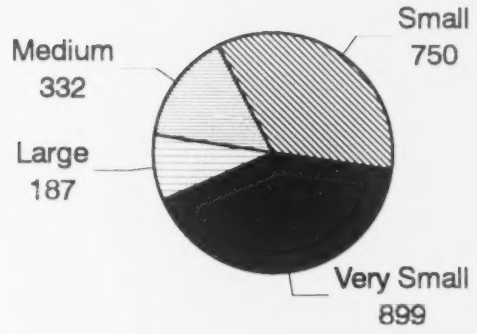
In all size categories, chemical companies are more export-oriented than manufacturing firms on the whole. Also, smaller companies are less export-oriented than larger companies (probably due to limited staff and resources). The products of these smaller companies may enter the international marketplace more through wholesalers or other intermediaries.

This information comes from the Exporter Database, a new joint project between the Census Bureau and the International Trade Administration (both within the U.S. Department of Commerce). The data come from the Economic Census (for which 1987 is the latest year available), and from aggregated data from Shippers' Export Declarations (SEDs).

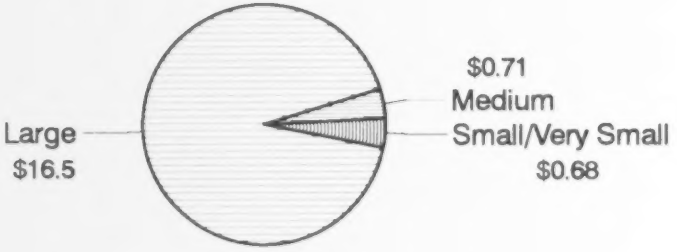
In 1987, 2,168 chemical-manufacturing companies exported a total of $18 billion -- about 69 percent of total U.S. chemical exports for that year:

Chart 3.6

U.S. Chemical Firms that Exported in 1987



2,168 Exporters



$17.9 Billion of Exports

The remainder of U.S. chemical exports were sold either by chemical subsidiaries of companies classified in other industries, or by intermediaries (mostly wholesalers). While small and very small chemical firms made up the bulk of chemical-manufacturing exporters, they accounted for only 3.8 percent of the industry's exports. (Their share of the industry's domestic sales was 8.2 percent.) The top 50 chemical-manufacturing exporters in 1987 accounted for 84 percent of the industry's total direct exports. This degree of concentration compares with 100 percent for the tobacco-products industry, and 60 percent for apparel (the high and low, respectively, within the manufacturing sector).

TABLE 3.2

SUMMARY OF U.S. CHEMICAL TRADE

(Share of Total)		1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
5 Chemicals & Rel. Prod.	Exports	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Imports	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
51 Organic Chemicals	Exports	26.8%	26.8%	27.5%	28.5%	29.7%	30.4%	29.1%	26.7%	25.4%	25.0%
	Imports	31.9%	31.2%	32.3%	31.9%	33.4%	35.3%	33.9%	32.6%	33.3%	33.2%
52 Inorganic Chemicals	Exports	14.9%	15.4%	16.6%	16.4%	14.6%	13.4%	11.8%	9.8%	9.5%	9.4%
	Imports	21.2%	22.5%	20.7%	19.4%	16.3%	15.8%	15.7%	14.6%	13.8%	12.1%
53 Dyeing & Coloring Mat.	Exports	3.6%	3.2%	3.1%	3.4%	3.7%	3.4%	3.0%	4.1%	3.8%	4.2%
	Imports	5.9%	5.8%	5.9%	7.0%	7.7%	6.5%	5.5%	5.8%	6.0%	5.9%
54 Pharmaceuticals	Exports	11.1%	10.1%	11.1%	11.8%	10.4%	10.2%	10.0%	10.5%	10.7%	12.2%
	Imports	7.4%	7.4%	7.7%	8.1%	9.2%	9.2%	10.2%	11.5%	13.0%	14.3%
55 Oils Perfumes & Cleansing	Exports	4.0%	3.6%	3.5%	3.6%	3.7%	3.5%	4.0%	5.0%	5.5%	6.0%
	Imports	3.9%	4.3%	4.8%	5.4%	5.5%	5.3%	5.1%	5.3%	5.3%	5.6%
56 Fertilizers	Exports	6.7%	9.6%	8.0%	4.1%	4.2%	3.8%	7.7%	6.6%	6.9%	5.4%
	Imports	9.0%	8.1%	6.5%	5.5%	4.7%	5.0%	4.9%	4.3%	3.9%	3.5%
57 Primary Plastics	Exports	13.7%	12.8%	12.5%	13.9%	15.5%	17.2%	15.7%	16.5%	17.5%	16.3%
	Imports	5.0%	5.6%	5.8%	6.6%	6.7%	6.8%	8.2%	8.9%	8.1%	8.2%
58 Non-Primary Plastics	Exports	6.2%	6.0%	5.8%	6.2%	6.4%	6.3%	6.0%	6.8%	6.5%	7.0%
	Imports	6.9%	6.8%	6.8%	7.6%	7.9%	7.8%	7.9%	8.0%	7.8%	7.5%
59 Chemical Mat. & Prod. NES	Exports	13.1%	12.5%	11.8%	12.2%	12.0%	11.7%	12.6%	14.0%	14.0%	14.5%
	Imports	8.8%	8.3%	9.4%	8.5%	8.7%	8.3%	8.7%	9.1%	8.9%	9.6%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports & Imports For Consumption

TABLE 3.3

U.S. EXPORTS BY COUNTRY OF DESTINATION
SITC 5 CHEMICALS AND RELATED PRODUCTS
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	2,576	12.9%	2,857	2,714	2,613	3,221	3,751	4,211	6,050	6,555	7,285	16.6%	11.1%
Japan	2,603	13.0%	3,000	2,914	3,062	3,401	3,982	4,665	4,583	5,048	4,710	10.7%	-6.7%
United Kingdom	842	4.2%	922	837	911	1,087	1,367	1,554	1,527	1,581	1,876	4.3%	18.7%
Germany	917	4.6%	1,079	1,057	1,177	1,178	1,369	1,516	1,775	1,911	1,972	4.5%	3.2%
Netherlands	941	4.7%	1,066	1,204	1,184	1,488	1,685	2,034	2,190	2,359	2,404	5.5%	1.9%
France	488	2.4%	594	665	718	729	833	931	1,107	1,113	1,314	3.0%	18.1%
Italy	354	1.8%	389	438	482	560	638	731	805	909	1,065	2.4%	17.2%
Other EC	1,519	7.6%	1,762	1,710	1,800	2,045	2,426	2,994	3,105	3,387	3,420	7.8%	1.0%
Total EC	5,060	25.3%	5,811	5,912	6,272	7,086	8,319	9,759	10,510	11,259	12,051	27.4%	7.0%
Non-EC West Europe	917	4.6%	832	889	750	821	915	1,157	1,138	1,064	1,037	2.4%	-2.5%
Total Western Europe	5,977	29.9%	6,643	6,801	7,022	7,907	9,235	10,916	11,648	12,323	13,088	29.8%	6.2%
Other Developed Countries	970	4.9%	1,122	908	925	1,085	1,412	1,702	1,549	1,696	1,726	3.9%	1.7%
Total Developed	12,127	60.7%	13,622	13,338	13,622	15,614	18,379	21,494	23,831	25,623	26,809	61.0%	4.6%
Saudi Arabia	273	1.4%	255	203	180	220	239	213	249	303	272	0.6%	-10.4%
Other Middle East	180	0.9%	189	206	173	202	306	331	383	371	497	1.1%	33.8%
Total Middle East	452	2.3%	444	408	353	422	545	544	632	675	768	1.8%	13.9%
Mexico	1,055	5.3%	1,255	1,408	1,261	1,431	1,836	2,195	2,299	2,624	3,121	7.1%	18.9%
Total Central America	1,839	9.2%	2,059	2,126	1,984	2,172	2,713	3,206	3,353	3,739	4,265	9.7%	14.1%
Brazil	472	2.4%	546	489	738	655	644	774	897	949	925	2.1%	-2.6%
Total South America	1,747	8.8%	2,106	1,802	2,225	2,427	2,720	2,712	2,880	3,318	3,370	7.7%	1.6%
Total Latin America	3,586	18.0%	4,165	3,928	4,210	4,599	5,434	5,918	6,233	7,057	7,635	17.4%	8.2%
South Korea	524	2.6%	675	598	749	983	1,373	1,642	1,690	1,658	1,494	3.4%	-9.9%
Singapore	286	1.4%	294	253	302	371	481	649	690	752	839	1.9%	11.7%
Taiwan	690	3.5%	694	542	832	1,115	1,516	1,751	1,529	1,840	1,989	4.5%	8.1%
Hong Kong	271	1.4%	316	344	389	562	829	692	746	923	813	1.9%	-11.9%
Total Asian NICs	1,771	8.9%	1,979	1,737	2,273	3,032	4,199	4,733	4,656	5,173	5,135	11.7%	-0.7%
Other Asia	1,108	5.6%	1,396	1,036	1,017	1,444	2,132	2,116	2,147	2,820	2,418	5.5%	-14.2%
Total East Asia	2,879	14.4%	3,375	2,773	3,290	4,476	6,331	6,849	6,803	7,993	7,554	17.2%	-5.5%
Total Developing	7,111	35.6%	8,189	7,570	8,081	9,307	11,882	13,450	13,765	15,292	15,773	35.9%	3.1%
China	353	1.8%	645	507	422	748	1,308	1,136	1,054	1,671	1,208	2.8%	-27.7%
Soviet Union (former)	305	1.5%	266	318	294	282	277	332	280	326	86	0.2%	-73.6%
Eastern Europe	67	0.3%	101	90	94	65	59	77	58	62	83	0.2%	33.7%
Total World	19,969	100.0%	22,833	21,831	22,524	26,026	31,911	36,489	38,989	42,974	43,964	100.0%	2.3%

Source: U.S. Department of Commerce
Standard International Trade Code, Revision 3; Domestic Exports

TABLE 3.4

U.S. IMPORTS BY COUNTRY OF ORIGIN
SITC 5 CHEMICALS AND RELATED PRODUCTS
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	2,393	22.0%	3,121	2,879	2,782	3,072	3,839	3,928	4,282	4,348	4,943	18.2%	13.7%
Japan	1,141	10.5%	1,390	1,511	1,894	2,264	2,364	2,367	2,387	2,739	3,218	11.8%	17.5%
United Kingdom	1,034	9.5%	1,292	1,230	1,521	1,497	2,085	2,018	2,064	2,228	2,604	9.6%	16.9%
Germany	1,297	11.9%	1,642	1,553	1,899	2,230	2,658	2,802	3,045	3,228	3,612	13.3%	11.9%
Netherlands	475	4.4%	523	683	559	580	722	708	767	671	753	2.8%	12.2%
France	864	8.0%	1,152	1,437	1,205	1,370	1,507	1,400	1,399	1,573	1,759	6.5%	11.8%
Italy	321	3.0%	455	583	515	634	745	700	796	865	959	3.5%	10.9%
Other EC	539	5.0%	755	807	793	917	1,181	1,360	1,433	1,530	1,912	7.0%	25.0%
Total EC	4,531	41.7%	5,818	6,294	6,491	7,228	8,897	8,988	9,505	10,095	11,600	42.6%	14.9%
Non-EC West Europe	546	5.0%	676	904	919	1,067	1,348	1,412	1,633	1,848	2,136	7.9%	15.6%
Total Western Europe	5,077	46.7%	6,495	7,197	7,410	8,295	10,245	10,400	11,137	11,943	13,737	50.5%	15.0%
Other Developed Countries	458	4.2%	438	417	528	277	366	328	393	455	412	1.5%	-9.3%
Total Developed	9,069	83.4%	11,443	12,004	12,614	13,907	16,814	17,024	18,200	19,485	22,309	82.0%	14.5%
Saudi Arabia	1	0.0%	1	35	76	52	75	92	83	86	107	0.4%	24.2%
Other Middle East	122	1.1%	132	189	176	192	224	274	269	283	301	1.1%	6.6%
Total Middle East	123	1.1%	133	224	252	244	299	366	352	369	408	1.5%	10.7%
Mexico	279	2.6%	481	440	326	385	550	570	647	700	820	3.0%	17.2%
Total Central America	452	4.2%	722	694	601	632	814	1,061	1,159	1,248	1,397	5.1%	11.9%
Brazil	242	2.2%	399	399	266	233	340	310	306	271	326	1.2%	20.4%
Total South America	561	5.2%	568	578	438	406	572	585	584	570	714	2.6%	25.3%
Total Latin America	1,013	9.3%	1,290	1,272	1,039	1,038	1,386	1,646	1,743	1,818	2,111	7.8%	16.1%
South Korea	59	0.5%	80	89	134	152	188	185	252	241	266	1.0%	10.2%
Singapore	8	0.1%	18	67	123	143	159	176	379	495	556	2.0%	12.4%
Taiwan	183	1.7%	221	238	283	307	335	347	349	394	405	1.5%	2.7%
Hong Kong	8	0.1%	18	20	26	29	35	33	42	36	48	0.2%	34.6%
Total Asian NICs	258	2.4%	336	414	566	631	717	740	1,022	1,166	1,275	4.7%	9.3%
Other Asia	181	1.7%	255	249	284	309	359	413	472	525	651	2.4%	24.0%
Total East Asia	439	4.0%	591	664	850	939	1,075	1,153	1,493	1,691	1,926	7.1%	13.9%
Total Developing	1,474	13.6%	1,904	2,055	2,020	2,108	2,654	3,017	3,396	3,674	4,127	15.2%	12.3%
China	129	1.2%	149	154	170	193	225	271	335	387	501	1.8%	29.5%
Soviet Union (former)	144	1.3%	207	195	163	91	116	108	163	184	191	0.7%	3.8%
Eastern Europe	53	0.5%	117	182	162	70	102	99	80	79	86	0.3%	8.9%
Total World	10,869	100.0%	13,820	14,590	15,129	16,369	19,911	20,519	22,173	23,808	27,214	100.0%	14.3%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Imports For Consumption

TABLE 3.5

U.S. TRADE BALANCE BY COUNTRY
SITC 5 CHEMICALS AND RELATED PRODUCTS
(Millions of Dollars)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Canada	183	-263	-165	-169	150	-87	283	1,768	2,207	2,342
Japan	1,462	1,610	1,403	1,168	1,137	1,618	2,298	2,196	2,309	1,492
United Kingdom	-192	-371	-393	-611	-411	-718	-463	-536	-647	-728
Germany	-380	-564	-496	-721	-1,052	-1,289	-1,287	-1,270	-1,317	-1,641
Netherlands	466	543	521	626	909	963	1,325	1,423	1,687	1,650
France	-376	-557	-772	-487	-641	-674	-469	-292	-460	-445
Italy	32	-66	-144	-33	-74	-106	31	8	44	106
Other EC	979	1,007	903	1,008	1,128	1,246	1,634	1,672	1,857	1,508
Total EC	529	-7	-382	-219	-141	-578	770	1,005	1,164	451
Non-EC West Europe	371	156	-15	-169	-246	-432	-255	-495	-784	-1,099
Total Western Europe	900	149	-396	-388	-387	-1,011	516	511	380	-648
Other Developed Countries	513	684	491	397	808	1,046	1,373	1,156	1,242	1,313
Total Developed	3,058	2,180	1,333	1,008	1,707	1,565	4,470	5,631	6,138	4,499
Saudi Arabia	271	253	168	104	168	164	121	166	217	165
Other Middle East	57	57	16	-3	11	82	57	114	89	196
Total Middle East	329	311	184	101	178	246	178	28[illegible]	306	360
Mexico	776	774	968	936	1,047	1,286	1,625	1,653	1,925	2,301
Total Central America	1,388	1,337	1,432	1,384	1,540	1,900	2,145	2,195	2,490	2,868
Brazil	230	147	89	473	422	304	464	591	678	599
Total South America	1,185	1,538	1,224	1,787	2,021	2,148	2,127	2,296	2,748	2,656
Total Latin America	2,573	2,875	2,656	3,171	3,561	4,048	4,272	4,490	5,238	5,524
South Korea	465	595	509	616	831	1,185	1,457	1,438	1,417	1,228
Singapore	279	276	185	179	228	322	473	312	256	283
Taiwan	507	473	304	549	808	1,181	1,404	1,181	1,446	1,584
Hong Kong	263	298	324	363	534	794	659	704	887	765
Total Asian NICs	1,513	1,643	1,323	1,707	2,401	3,482	3,993	3,634	4,006	3,860
Other Asia	927	1,141	787	733	1,135	1,773	1,703	1,675	2,295	1,768
Total East Asia	2,440	2,784	2,109	2,440	3,537	5,256	5,696	5,310	6,302	5,627
Total Developing	5,637	6,285	5,515	6,061	7,199	9,227	10,433	10,370	11,619	11,646
China	224	495	353	252	556	1,082	864	718	1,284	707
Soviet Union (former)	160	59	123	131	191	161	224	118	143	-105
Eastern Europe	14	-16	-92	-67	-5	-43	-22	-22	-17	-3
Total World	9,100	9,013	7,241	7,395	9,657	12,000	15,970	16,815	19,166	16,750

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports & Import for Consumption

TABLE 3.6

U.S. EXPORTS BY COUNTRY OF DESTINATION
SITC 51 ORGANIC CHEMICALS
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	605	11.3%	668	637	642	742	867	942	1,124	1,089	1,126	10.2%	3.4%
Japan	653	12.2%	704	690	743	900	1,120	1,176	1,126	1,178	992	9.0%	-15.8%
United Kingdom	248	4.6%	259	244	251	256	391	372	350	362	388	3.5%	7.3%
Germany	138	2.6%	181	195	206	247	344	379	438	488	463	4.2%	-5.0%
Netherlands	473	8.9%	491	570	522	763	769	955	825	891	925	8.4%	3.8%
France	84	1.6%	93	90	82	96	130	131	194	205	252	2.3%	22.7%
Italy	109	2.0%	104	150	153	177	165	175	196	205	256	2.3%	25.1%
Other EC	425	8.0%	503	498	560	665	820	1,024	1,036	1,147	1,177	10.7%	2.6%
Total EC	1,477	27.6%	1,630	1,746	1,774	2,204	2,620	3,037	3,039	3,297	3,461	31.5%	5.0%
Non-EC West Europe	250	4.7%	274	259	196	271	309	476	347	348	324	2.9%	-7.0%
Total Western Europe	1,726	32.3%	1,905	2,005	1,970	2,474	2,929	3,513	3,386	3,645	3,784	34.4%	3.8%
Other Developed Countries	246	4.6%	281	212	224	249	365	356	321	380	409	3.7%	7.6%
Total Developed	3,231	60.4%	3,558	3,543	3,579	4,365	5,281	5,987	5,957	6,292	6,311	57.4%	0.3%
Saudi Arabia	9	0.2%	18	21	26	31	37	30	28	26	25	0.2%	-4.1%
Other Middle East	26	0.5%	24	32	29	35	51	50	57	77	109	1.0%	42.4%
Total Middle East	35	0.7%	42	52	55	66	88	79	85	102	134	1.2%	30.8%
Mexico	420	7.9%	544	604	476	523	665	680	599	705	806	7.3%	14.3%
Total Central America	584	10.9%	709	735	617	640	778	797	713	836	955	8.7%	14.2%
Brazil	168	3.2%	197	197	303	280	258	285	433	359	365	3.3%	1.7%
Total South America	543	10.2%	687	589	779	835	935	861	1,038	996	1,029	9.4%	3.3%
Total Latin America	1,128	21.1%	1,397	1,324	1,397	1,475	1,712	1,657	1,751	1,832	1,984	18.0%	8.3%
South Korea	259	4.8%	325	290	383	472	718	793	692	597	519	4.7%	-13.0%
Singapore	64	1.2%	75	76	97	106	165	199	220	205	238	2.2%	16.0%
Taiwan	275	5.1%	248	287	475	669	942	1,051	865	1,033	995	9.0%	-3.7%
Hong Kong	73	1.4%	67	63	57	101	134	107	108	145	80	0.7%	-45.1%
Total Asian NICs	672	12.6%	716	717	1,012	1,348	1,960	2,149	1,884	1,981	1,832	16.7%	-7.5%
Other Asia	192	3.6%	295	251	244	338	487	528	520	553	556	5.1%	0.5%
Total East Asia	863	16.1%	1,011	968	1,256	1,686	2,446	2,677	2,404	2,534	2,388	21.7%	-5.7%
Total Developing	2,080	38.9%	2,446	2,352	2,741	3,186	4,122	4,319	4,187	4,354	4,466	40.6%	2.6%
China	33	0.6%	98	89	81	153	280	286	245	270	206	1.9%	-23.8%
Soviet Union (former)	0	0.0%	4	2	9	6	10	6	4	14	7	0.1%	-48.3%
Eastern Europe	7	0.1%	9	12	15	11	13	15	12	5	10	0.1%	90.7%
Total World	5,351	100.0%	6,114	5,999	6,425	7,720	9,707	10,613	10,405	10,936	11,001	100.0%	0.6%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports

TABLE 3.7

U.S. IMPORTS BY COUNTRY OF ORIGIN
SITC 51 ORGANIC CHEMICALS
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	534	15.4%	579	583	463	529	802	601	798	757	851	9.4%	12.4%
Japan	394	11.3%	471	525	680	810	854	927	839	993	1,191	13.2%	19.9%
United Kingdom	489	14.1%	578	572	639	703	885	875	769	782	890	9.9%	13.8%
Germany	469	13.5%	592	584	651	753	1,060	1,047	1,014	1,069	1,267	14.0%	18.5%
Netherlands	292	8.4%	332	385	281	317	419	360	397	321	346	3.8%	7.5%
France	218	6.3%	273	308	276	365	437	402	419	452	466	5.2%	3.2%
Italy	148	4.3%	203	282	213	257	320	301	293	381	373	4.1%	-2.2%
Other EC	229	6.6%	335	335	353	380	524	554	581	622	666	7.4%	7.2%
Total EC	1,845	53.1%	2,313	2,466	2,414	2,775	3,645	3,539	3,474	3,627	4,008	44.3%	10.5%
Non-EC West Europe	217	6.2%	264	303	304	405	564	503	537	657	720	8.0%	9.6%
Total Western Europe	2,062	59.4%	2,577	2,769	2,718	3,180	4,209	4,042	4,011	4,285	4,728	52.3%	10.4%
Other Developed Countries	15	0.4%	22	29	26	37	67	42	34	44	39	0.4%	-12.9%
Total Developed	3,005	86.5%	3,649	3,907	3,886	4,556	5,933	5,612	5,682	6,080	6,809	75.3%	12.0%
Saudi Arabia	1	0.0%	1	33	70	50	68	79	74	77	102	1.1%	31.6%
Other Middle East	26	0.7%	42	61	73	75	102	106	129	149	162	1.8%	8.6%
Total Middle East	27	0.8%	43	94	142	125	171	186	203	227	264	2.9%	16.4%
Mexico	31	0.9%	57	40	45	59	116	150	140	227	285	3.2%	25.4%
Total Central America	93	2.7%	128	173	223	210	258	510	520	618	720	8.0%	16.5%
Brazil	181	5.2%	278	218	163	136	189	129	127	140	165	1.8%	17.7%
Total South America	239	6.9%	328	290	217	195	241	205	210	261	353	3.9%	35.3%
Total Latin America	332	9.6%	456	463	440	405	499	714	731	879	1,073	11.9%	22.1%
South Korea	34	1.0%	39	43	60	66	77	71	73	72	89	1.0%	23.2%
Singapore	4	0.1%	8	61	113	129	135	157	306	414	509	5.6%	22.8%
Taiwan	15	0.4%	21	30	34	34	47	37	42	51	52	0.6%	1.4%
Hong Kong	1	0.0%	2	2	3	3	8	6	9	6	6	0.1%	-7.2%
Total Asian NICs	54	1.6%	70	136	211	232	268	271	430	544	655	7.2%	20.5%
Other Asia	37	1.1%	48	46	80	75	92	94	101	110	148	1.6%	35.3%
Total East Asia	91	2.6%	118	182	291	307	359	364	531	653	803	8.9%	23.0%
Total Developing	421	12.1%	584	723	844	821	1,013	1,250	1,447	1,733	2,096	23.2%	20.9%
China	34	1.0%	41	31	40	42	49	60	70	84	116	1.3%	38.9%
Soviet Union (former)	2	0.1%	12	19	19	17	14	15	10	7	5	0.1%	-32.2%
Eastern Europe	11	0.3%	21	33	33	25	25	15	12	13	16	0.2%	25.4%
Total World	3,473	100.0%	4,306	4,713	4,823	5,461	7,034	6,952	7,222	7,917	9,042	100.0%	14.2%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Imports For Consumption

TABLE 3.8

U.S. TRADE BALANCE BY COUNTRY
SITC 51 ORGANIC CHEMICALS
(Millions of Dollars)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Canada	71	88	54	179	212	65	340	325	331	274
Japan	260	233	165	63	90	266	249	286	185	-200
United Kingdom	-241	-319	-328	-388	-447	-494	-503	-419	-420	-502
Germany	-331	-411	-389	-445	-506	-716	-668	-576	-582	-803
Netherlands	181	159	185	241	446	350	596	428	570	579
France	-134	-180	-218	-194	-269	-307	-271	-225	-247	-215
Italy	-39	-99	-132	-60	-79	-155	-125	-97	-176	-117
Other EC	196	168	162	207	285	296	469	455	525	510
Total EC	-368	-683	-720	-639	-571	-1,025	-502	-435	-330	-547
Non-EC West Europe	33	10	-44	-108	-135	-255	-27	-190	-309	-397
Total Western Europe	-336	-672	-765	-748	-706	-1,280	-529	-625	-640	-944
Other Developed Countries	231	259	183	199	212	298	315	288	336	371
Total Developed	226	-91	-363	-307	-191	-651	375	274	212	-498
Saudi Arabia	8	17	-13	-44	-18	-32	-50	-46	-52	-77
Other Middle East	1	-18	-29	-43	-41	-52	-57	-72	-73	-53
Total Middle East	9	-1	-42	-87	-59	-83	-106	-118	-124	-130
Mexico	390	487	564	431	464	549	531	458	478	521
Total Central America	492	581	562	395	430	520	287	193	219	235
Brazil	-12	-81	-21	140	144	69	156	306	219	201
Total South America	304	359	298	562	640	694	656	827	735	675
Total Latin America	796	941	860	957	1,070	1,214	943	1,020	954	911
South Korea	225	287	247	323	406	641	722	619	525	430
Singapore	61	67	16	-17	-23	31	42	-86	-209	-270
Taiwan	259	227	257	441	635	895	1,013	823	982	943
Hong Kong	73	65	61	53	98	126	101	99	139	74
Total Asian NICs	618	646	581	801	1,116	1,692	1,878	1,454	1,437	1,177
Other Asia	155	248	205	164	263	395	434	419	444	408
Total East Asia	772	893	786	965	1,379	2,087	2,312	1,873	1,881	1,585
Total Developing	1,659	1,862	1,629	1,897	2,365	3,109	3,069	2,740	2,620	2,371
China	-1	57	58	40	112	231	227	175	186	89
Soviet Union (former)	-2	-8	-17	-10	-12	-4	-9	-6	7	3
Eastern Europe	-4	-12	-21	-18	-15	-12	0	0	-7	-6
Total World	1,879	1,808	1,286	1,602	2,260	2,673	3,661	3,183	3,019	1,958

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports & Import for Consumption

TABLE 3.9

U.S. EXPORTS BY COUNTRY OF DESTINATION
SITC 52 INORGANIC CHEMICALS
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	297	10.0%	312	329	345	387	484	483	460	489	490	11.9%	0.2%
Japan	632	21.3%	834	820	909	872	936	1,130	963	1,130	1,092	26.5%	-3.3%
United Kingdom	84	2.8%	114	71	89	168	149	203	126	133	171	4.2%	28.5%
Germany	370	12.5%	417	344	341	270	244	257	241	239	220	5.3%	-8.0%
Netherlands	63	2.1%	95	162	153	163	168	177	172	169	184	4.5%	8.7%
France	31	1.0%	138	207	243	159	129	95	56	67	83	2.0%	24.2%
Italy	16	0.5%	18	29	38	54	50	43	52	45	49	1.2%	9.3%
Other EC	89	3.0%	202	217	131	175	167	164	109	142	163	4.0%	14.6%
Total EC	653	22.0%	984	1,030	995	989	906	939	757	795	869	21.1%	9.4%
Non-EC West Europe	279	9.4%	177	248	125	80	92	56	76	47	50	1.2%	5.2%
Total Western Europe	932	31.4%	1,160	1,278	1,120	1,069	998	995	833	842	919	22.3%	9.2%
Other Developed Countries	116	3.9%	106	108	121	142	217	249	229	246	195	4.7%	-20.9%
Total Developed	1,977	66.7%	2,412	2,534	2,496	2,470	2,636	2,857	2,485	2,706	2,696	65.4%	-0.4%
Saudi Arabia	15	0.5%	17	9	8	10	16	7	5	8	7	0.2%	-13.8%
Other Middle East	15	0.5%	18	16	14	18	37	16	29	26	26	0.6%	3.4%
Total Middle East	30	1.0%	35	25	22	28	53	23	34	34	34	0.8%	-0.8%
Mexico	114	3.8%	115	136	127	168	182	205	223	259	276	6.7%	6.5%
Total Central America	181	6.1%	176	196	201	244	296	320	347	404	395	9.6%	-2.3%
Brazil	54	1.8%	74	72	114	109	100	109	76	80	70	1.7%	-12.8%
Total South America	195	6.6%	263	250	301	349	422	366	344	381	331	8.0%	-13.0%
Total Latin America	376	12.7%	439	446	502	593	718	686	691	785	726	17.6%	-7.5%
South Korea	58	2.0%	83	79	83	123	171	195	194	199	147	3.6%	-26.2%
Singapore	11	0.4%	10	9	12	15	18	25	21	18	25	0.6%	35.1%
Taiwan	157	5.3%	124	64	97	59	80	166	129	94	236	5.7%	152.0%
Hong Kong	13	0.5%	30	64	61	52	35	55	29	32	29	0.7%	-10.0%
Total Asian NICs	240	8.1%	246	217	253	250	304	442	375	343	436	10.6%	27.2%
Other Asia	101	3.4%	130	87	151	255	317	241	172	178	186	4.5%	4.2%
Total East Asia	340	11.5%	377	303	404	505	621	683	546	521	622	15.1%	19.3%
Total Developing	788	26.6%	925	926	1,011	1,061	1,371	1,357	1,294	1,353	1,385	33.6%	2.4%
China	20	0.7%	19	18	66	155	188	82	20	31	32	0.8%	0.9%
Soviet Union (former)	169	5.7%	143	132	86	87	80	15	5	5	2	0.1%	-50.6%
Eastern Europe	12	0.4%	7	15	25	17	15	7	12	6	4	0.1%	-37.5%
Total World	2,966	100.0%	3,506	3,625	3,683	3,789	4,289	4,319	3,816	4,102	4,119	100.0%	0.4%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports

TABLE 3.10

U.S. IMPORTS BY COUNTRY OF ORIGIN
SITC 52 INORGANIC CHEMICALS
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	686	29.8%	1,124	967	978	1,065	1,117	1,251	1,061	1,025	1,026	31.2%	0.1%
Japan	106	4.6%	105	110	110	157	151	164	158	184	214	6.5%	16.3%
United Kingdom	174	7.6%	203	126	277	111	314	222	244	197	308	9.4%	56.8%
Germany	177	7.7%	269	168	257	242	259	327	422	429	352	10.7%	-18.1%
Netherlands	31	1.4%	20	66	33	33	44	53	60	66	62	1.9%	-6.0%
France	298	12.9%	416	636	378	418	376	254	187	261	240	7.3%	-7.9%
Italy	13	0.6%	16	43	40	40	46	40	47	53	68	2.1%	26.6%
Other EC	42	1.8%	54	86	55	50	72	68	60	64	55	1.7%	-13.3%
Total EC	735	31.9%	979	1,126	1,040	894	1,111	964	1,021	1,070	1,085	33.0%	1.4%
Non-EC West Europe	55	2.4%	68	124	78	70	93	94	88	92	98	3.0%	7.2%
Total Western Europe	791	34.3%	1,047	1,250	1,118	965	1,204	1,058	1,109	1,162	1,183	36.0%	1.9%
Other Developed Countries	297	12.9%	256	233	342	96	141	96	150	209	176	5.4%	-15.7%
Total Developed	1,880	81.6%	2,531	2,560	2,548	2,283	2,612	2,569	2,478	2,579	2,600	79.1%	0.8%
Saudi Arabia	0	0.0%	0	0	0	2	7	11	4	5	5	0.2%	-6.6%
Other Middle East	17	0.7%	19	31	28	23	22	42	23	22	27	0.8%	26.7%
Total Middle East	17	0.7%	19	31	28	25	29	53	27	27	32	1.0%	20.2%
Mexico	166	7.2%	173	134	124	137	193	204	236	182	195	6.0%	7.2%
Total Central America	240	10.4%	305	206	164	177	251	294	320	293	290	8.8%	-1.3%
Brazil	11	0.5%	26	27	24	19	30	59	60	28	28	0.9%	-0.3%
Total South America	35	1.5%	55	53	51	53	85	130	111	85	88	2.7%	3.0%
Total Latin America	274	11.9%	360	259	215	230	336	424	430	379	378	11.5%	-0.3%
South Korea	6	0.3%	6	3	3	3	5	6	3	4	4	0.1%	-10.7%
Singapore	0	0.0%	0	0	1	0	0	0	1	0	0	0.0%	-82.0%
Taiwan	5	0.2%	6	6	8	8	10	10	10	9	9	0.3%	-1.6%
Hong Kong	0	0.0%	1	3	3	3	5	7	6	6	2	0.1%	-63.2%
Total Asian NICs	11	0.5%	14	12	15	14	20	23	20	20	15	0.5%	-23.5%
Other Asia	16	0.7%	32	37	32	38	53	59	100	92	120	3.7%	30.7%
Total East Asia	27	1.2%	46	49	47	53	73	81	120	112	135	4.1%	21.1%
Total Developing	304	13.2%	399	305	261	273	392	515	497	462	439	13.4%	-4.9%
China	16	0.7%	31	36	31	38	51	57	98	89	116	3.5%	30.3%
Soviet Union (former)	99	4.3%	142	119	84	62	77	83	151	155	125	3.8%	-19.1%
Eastern Europe	5	0.2%	4	3	6	6	10	4	6	7	5	0.2%	-20.4%
Total World	2,303	100.0%	3,107	3,023	2,930	2,662	3,142	3,228	3,230	3,292	3,286	100.0%	-0.2%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Imports For Consumption

TABLE 3.11

U.S. TRADE BALANCE BY COUNTRY
SITC 52 INORGANIC CHEMICALS
(Millions of Dollars)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Canada	-389	-812	-639	-633	-678	-633	-768	-602	-536	-537
Japan	526	729	710	799	715	786	966	805	946	878
United Kingdom	-90	-90	-56	-188	56	-164	-19	-117	-63	-137
Germany	193	148	175	84	27	-15	-69	-181	-190	-132
Netherlands	32	75	96	121	131	125	124	112	103	122
France	-267	-277	-429	-135	-259	-248	-159	-131	-194	-157
Italy	3	2	-14	-2	14	4	3	4	-9	-19
Other EC	47	148	131	75	125	94	96	48	78	107
Total EC	-82	5	-96	-45	94	-205	-25	-264	-275	-216
Non-EC West Europe	224	109	124	47	10	-1	-38	-12	-45	-49
Total Western Europe	141	113	28	2	104	-205	-63	-276	-320	-265
Other Developed Countries	-181	-149	-125	-221	46	76	154	76	38	19
Total Developed	97	-119	-26	-53	187	23	288	7	127	96
Saudi Arabia	15	17	9	8	8	9	-4	1	3	2
Other Middle East	-2	-1	-16	-14	-5	15	-26	6	4	-1
Total Middle East	13	16	-6	-6	2	24	-30	6	7	1
Mexico	-52	-57	2	2	31	-11	1	-13	77	80
Total Central America	-59	-129	-10	37	67	45	27	28	110	105
Brazil	43	48	45	90	90	70	50	15	52	42
Total South America	161	208	197	250	296	337	236	234	296	243
Total Latin America	102	79	187	287	363	382	263	261	406	348
South Korea	53	77	76	80	121	166	189	191	195	143
Singapore	11	9	9	11	15	18	25	20	18	25
Taiwan	152	118	58	89	51	70	156	119	84	227
Hong Kong	13	29	61	58	49	31	49	24	26	26
Total Asian NICs	229	232	205	238	236	285	419	355	323	421
Other Asia	84	99	50	119	217	264	182	72	86	66
Total East Asia	314	331	255	357	453	548	602	426	410	487
Total Developing	484	525	620	750	787	979	842	797	891	946
China	4	-11	-18	34	117	137	26	-77	-58	-84
Soviet Union (former)	71	1	13	2	24	3	-68	-146	-150	-123
Eastern Europe	7	3	11	19	11	5	4	6	0	-1
Total World	663	399	602	753	1,127	1,147	1,091	586	810	833

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports & Import for Consumption

TABLE 3.12

U.S. EXPORTS BY COUNTRY OF DESTINATION
SITC 53 DYEING; TANNING AND COLORING MATERIALS
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	164	22.9%	179	172	156	223	227	230	421	482	524	28.1%	8.7%
Japan	51	7.1%	56	62	68	76	95	93	116	113	104	5.6%	-7.9%
United Kingdom	40	5.6%	35	29	34	43	58	70	104	90	111	6.0%	24.3%
Germany	26	3.6%	27	27	29	44	44	37	54	53	49	2.6%	-7.6%
Netherlands	35	5.0%	37	35	45	47	60	44	59	50	67	3.6%	35.0%
France	16	2.2%	13	12	19	24	23	16	19	29	21	1.1%	-27.5%
Italy	11	1.5%	10	8	9	13	14	13	16	17	19	1.0%	14.1%
Other EC	41	5.7%	34	31	47	53	80	81	151	130	159	8.5%	22.3%
Total EC	168	23.5%	155	143	183	224	278	261	402	368	426	22.8%	15.9%
Non-EC West Europe	19	2.7%	20	21	29	28	35	37	48	39	38	2.1%	-0.9%
Total Western Europe	188	26.2%	176	164	212	253	313	298	450	406	465	24.9%	14.3%
Other Developed Countries	29	4.0%	31	26	26	28	35	36	39	40	48	2.6%	21.1%
Total Developed	431	60.3%	441	424	463	580	670	657	1,026	1,040	1,140	61.1%	9.6%
Saudi Arabia	30	4.2%	19	12	11	13	14	14	12	17	17	0.9%	4.7%
Other Middle East	15	2.1%	13	11	12	11	16	23	18	20	21	1.1%	3.9%
Total Middle East	45	6.3%	33	23	23	24	30	37	31	37	39	2.1%	4.2%
Mexico	38	5.3%	45	46	48	58	67	69	98	113	162	8.7%	43.2%
Total Central America	74	10.4%	83	82	87	100	112	124	157	174	228	12.2%	31.2%
Brazil	12	1.7%	10	8	14	13	14	20	22	34	39	2.1%	16.5%
Total South America	56	7.9%	58	49	60	77	85	66	76	99	121	6.5%	21.6%
Total Latin America	131	18.3%	141	131	148	177	196	190	233	274	349	18.7%	27.7%
South Korea	18	2.5%	18	18	27	43	48	52	87	67	68	3.7%	2.1%
Singapore	14	2.0%	13	10	13	16	19	23	41	38	43	2.3%	13.8%
Taiwan	21	2.9%	21	19	27	35	42	34	37	58	65	3.5%	12.6%
Hong Kong	12	1.6%	16	16	21	26	32	35	38	50	51	2.8%	1.9%
Total Asian NICs	64	9.0%	68	63	89	121	141	144	203	213	228	12.2%	7.0%
Other Asia	20	2.8%	22	21	23	29	38	47	61	58	87	4.7%	49.9%
Total East Asia	84	11.8%	90	84	112	150	179	191	264	271	315	16.9%	16.2%
Total Developing	277	38.7%	283	250	294	361	416	424	535	581	676	36.2%	16.5%
China	1	0.1%	2	5	5	5	10	14	22	22	43	2.3%	100.4%
Soviet Union (former)	4	0.6%	3	4	4	5	3	1	4	3	4	0.2%	21.3%
Eastern Europe	2	0.3%	1	2	2	1	2	1	1	1	3	0.2%	143.5%
Total World	715	100.0%	731	685	767	952	1,100	1,097	1,588	1,648	1,867	100.0%	13.3%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports

TABLE 3.13

U.S. IMPORTS BY COUNTRY OF ORIGIN
SITC 53 DYEING; TANNING AND COLORING MATERIALS
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	51	7.9%	62	63	69	80	103	112	157	177	190	11.8%	7.5%
Japan	123	19.1%	179	195	271	340	259	154	169	219	240	14.8%	9.4%
United Kingdom	58	9.1%	70	73	89	111	137	109	132	148	168	10.4%	13.8%
Germany	164	25.6%	197	201	268	331	330	316	358	393	446	27.6%	13.6%
Netherlands	17	2.6%	22	23	34	34	39	31	32	32	34	2.1%	5.9%
France	54	8.3%	74	69	74	68	73	59	56	61	60	3.7%	-0.3%
Italy	7	1.1%	11	15	18	18	30	26	19	19	19	1.2%	-1.2%
Other EC	48	7.5%	52	62	68	74	71	70	55	64	76	4.7%	18.7%
Total EC	348	54.2%	425	442	552	637	679	612	653	716	803	49.7%	12.2%
Non-EC West Europe	59	9.2%	63	64	99	114	116	112	127	117	151	9.4%	29.0%
Total Western Europe	407	63.3%	489	506	651	751	795	725	780	834	955	59.0%	14.5%
Other Developed Countries	9	1.4%	8	9	12	10	9	7	4	5	12	0.8%	164.0%
Total Developed	590	91.8%	737	774	1,003	1,181	1,166	998	1,111	1,234	1,397	86.4%	13.2%
Saudi Arabia	0	0.0%	0	0	0	0	0	0	0	0	0	0.0%	-76.3%
Other Middle East	1	0.1%	0	2	1	1	2	1	0	0	0	0.0%	122.7%
Total Middle East	1	0.1%	0	2	1	1	2	1	0	0	1	0.0%	68.9%
Mexico	6	0.9%	25	31	13	19	41	33	39	26	24	1.5%	-6.0%
Total Central America	6	0.9%	26	32	14	21	42	34	40	26	25	1.6%	-4.4%
Brazil	6	0.9%	9	9	6	8	7	3	3	2	9	0.6%	269.6%
Total South America	30	4.7%	18	18	16	19	21	21	20	20	35	2.2%	78.6%
Total Latin America	36	5.6%	44	50	30	40	63	55	59	46	60	3.7%	31.1%
South Korea	2	0.4%	3	5	5	6	8	9	19	22	23	1.4%	5.1%
Singapore	0	0.0%	0	0	0	0	1	3	6	7	8	0.5%	12.7%
Taiwan	3	0.5%	5	3	6	8	10	15	21	26	25	1.6%	-1.2%
Hong Kong	1	0.1%	1	1	1	2	2	3	3	2	2	0.1%	-8.5%
Total Asian NICs	6	1.0%	10	9	12	16	21	30	51	57	58	3.6%	2.6%
Other Asia	3	0.5%	2	5	6	8	14	15	25	30	41	2.5%	38.4%
Total East Asia	9	1.5%	12	13	18	24	35	45	76	86	99	6.1%	14.9%
Total Developing	48	7.5%	61	68	52	73	108	113	147	148	172	10.6%	16.4%
China	3	0.5%	2	4	6	8	13	14	22	26	34	2.1%	30.8%
Soviet Union (former)	0	0.0%	0	0	0	0	0	0	0	0	0	0.0%	267.8%
Eastern Europe	2	0.3%	2	9	5	2	8	4	4	9	14	0.9%	55.9%
Total World	642	100.0%	803	855	1,066	1,264	1,295	1,129	1,283	1,417	1,617	100.0%	14.1%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Imports For Consumption

TABLE 3.14

U.S. TRADE BALANCE BY COUNTRY
SITC 53 DYEING; TANNING AND COLORING MATERIALS
(Millions of Dollars)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Canada	113	117	109	87	143	124	118	265	305	334
Japan	-72	-123	-133	-203	-263	-165	-61	-54	-107	-136
United Kingdom	-19	-35	-43	-55	-69	-79	-39	-29	-58	-57
Germany	-139	-170	-174	-239	-287	-285	-279	-305	-340	-397
Netherlands	19	15	11	11	13	21	12	27	17	33
France	-38	-61	-57	-55	-44	-50	-43	-37	-32	-39
Italy	4	-1	-6	-9	-5	-17	-13	-3	-2	0
Other EC	-7	-17	-31	-21	-20	9	11	96	66	84
Total EC	-180	-270	-300	-369	-412	-401	-351	-251	-348	-377
Non-EC West Europe	-39	-43	-43	-70	-86	-81	-75	-79	-79	-113
Total Western Europe	-219	-313	-343	-438	-498	-482	-426	-330	-427	-490
Other Developed Countries	19	22	17	13	18	26	29	35	35	36
Total Developed	-159	-297	-350	-541	-601	-497	-341	-85	-194	-257
Saudi Arabia	30	19	12	11	13	14	14	12	17	17
Other Middle East	15	13	9	11	10	15	22	18	20	21
Total Middle East	44	32	21	22	23	28	36	30	37	38
Mexico	32	19	15	35	39	26	35	59	88	138
Total Central America	68	57	50	73	79	69	90	117	148	203
Brazil	7	1	-1	8	4	7	18	19	31	31
Total South America	26	40	31	44	58	64	45	57	80	86
Total Latin America	94	97	81	117	137	133	135	174	228	289
South Korea	16	15	13	22	37	40	43	68	45	45
Singapore	14	13	10	13	16	18	20	34	31	36
Taiwan	17	16	16	22	27	32	19	15	32	40
Hong Kong	11	15	15	20	25	30	32	35	48	49
Total Asian NICs	58	58	54	77	105	120	114	152	157	170
Other Asia	16	19	17	17	20	24	31	36	28	46
Total East Asia	75	78	71	94	126	144	146	188	185	216
Total Developing	229	222	183	242	288	308	311	388	433	505
China	-2	0	1	-1	-2	-3	0	0	-4	9
Soviet Union (former)	4	3	4	4	5	3	1	4	3	4
Eastern Europe	1	0	-7	-3	-1	-6	-4	-3	-8	-11
Total World	73	-72	-170	-299	-311	-195	-32	305	230	250

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports & Import for Consumption

TABLE 3.15

U.S. EXPORTS BY COUNTRY OF DESTINATION
SITC 54 MEDICINAL AND PHARMACEUTICAL PRODUCTS
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	174	7.8%	174	181	185	212	255	266	450	552	757	14.1%	37.1%
Japan	504	22.7%	524	549	576	613	725	785	764	809	817	15.3%	1.0%
United Kingdom	128	5.8%	140	136	157	154	185	193	216	229	286	5.3%	24.9%
Germany	132	6.0%	174	192	247	264	290	330	319	323	371	6.9%	14.9%
Netherlands	51	2.3%	58	62	64	69	80	142	191	202	283	5.3%	40.3%
France	166	7.5%	160	143	154	156	204	231	270	287	367	6.9%	27.9%
Italy	109	4.9%	108	122	146	155	223	257	276	347	432	8.1%	24.5%
Other EC	230	10.4%	227	260	305	242	339	420	451	555	594	11.1%	7.0%
Total EC	816	36.8%	867	916	1,073	1,039	1,320	1,573	1,723	1,943	2,334	43.6%	20.1%
Non-EC West Europe	166	7.5%	143	161	201	201	209	233	259	260	289	5.4%	11.1%
Total Western Europe	982	44.3%	1,010	1,077	1,274	1,240	1,529	1,806	1,982	2,203	2,622	49.0%	19.0%
Other Developed Countries	70	3.2%	81	78	82	87	104	111	118	130	154	2.9%	17.9%
Total Developed	1,730	78.0%	1,789	1,885	2,118	2,153	2,614	2,968	3,314	3,694	4,350	81.2%	17.8%
Saudi Arabia	43	2.0%	51	48	41	50	54	44	44	47	61	1.1%	29.0%
Other Middle East	26	1.2%	27	26	25	19	27	39	32	34	53	1.0%	55.1%
Total Middle East	69	3.1%	78	74	66	68	81	84	75	82	114	2.1%	40.0%
Mexico	30	1.4%	38	46	47	48	57	73	105	120	130	2.4%	8.0%
Total Central America	108	4.9%	120	125	129	119	143	168	197	217	244	4.6%	12.4%
Brazil	32	1.5%	22	22	38	36	32	52	54	73	70	1.3%	-4.2%
Total South America	142	6.4%	135	139	164	167	156	143	160	201	251	4.7%	25.1%
Total Latin America	249	11.2%	255	264	293	286	299	310	357	418	495	9.2%	18.5%
South Korea	22	1.0%	22	26	24	29	41	43	53	64	58	1.1%	-9.5%
Singapore	7	0.3%	6	6	8	10	12	16	13	13	17	0.3%	29.2%
Taiwan	19	0.9%	25	26	32	33	45	42	50	60	71	1.3%	19.1%
Hong Kong	21	1.0%	26	26	26	33	39	39	56	49	52	1.0%	5.9%
Total Asian NICs	69	3.1%	78	84	90	105	137	140	171	186	198	3.7%	6.4%
Other Asia	55	2.5%	53	38	43	58	54	63	77	80	88	1.6%	10.2%
Total East Asia	124	5.6%	132	122	133	162	191	203	248	266	286	5.3%	7.6%
Total Developing	480	21.6%	517	521	533	541	634	663	743	837	948	17.7%	13.3%
China	1	0.1%	1	2	3	18	6	8	14	15	23	0.4%	52.2%
Soviet Union (former)	1	0.0%	1	1	1	1	2	13	25	47	12	0.2%	-74.2%
Eastern Europe	5	0.2%	6	8	7	6	5	8	6	13	24	0.4%	78.1%
Total World	2,217	100.0%	2,316	2,418	2,662	2,718	3,262	3,660	4,103	4,606	5,357	100.0%	16.3%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports

TABLE 3.16

U.S. IMPORTS BY COUNTRY OF ORIGIN
SITC 54 MEDICINAL AND PHARMACEUTICAL PRODUCTS
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	16	2.0%	21	26	24	32	44	71	99	118	171	4.4%	45.6%
Japan	111	13.9%	102	115	162	174	193	213	214	296	365	9.4%	23.2%
United Kingdom	134	16.7%	234	200	205	238	344	365	451	587	652	16.8%	11.2%
Germany	132	16.4%	136	151	187	270	292	304	337	406	502	12.9%	23.8%
Netherlands	25	3.1%	27	39	36	33	28	39	37	38	42	1.1%	9.8%
France	50	6.3%	49	52	65	72	78	88	112	129	167	4.3%	30.0%
Italy	84	10.5%	110	127	108	173	187	169	247	217	280	7.2%	29.0%
Other EC	68	8.5%	123	88	84	134	191	266	334	427	640	16.4%	49.8%
Total EC	493	61.3%	679	656	686	920	1,121	1,230	1,516	1,803	2,283	58.6%	26.6%
Non-EC West Europe	99	12.3%	131	230	244	266	339	442	570	656	818	21.0%	24.7%
Total Western Europe	591	73.6%	809	886	930	1,185	1,460	1,672	2,085	2,459	3,101	79.6%	26.1%
Other Developed Countries	10	1.2%	11	15	9	8	11	13	11	14	14	0.4%	0.7%
Total Developed	728	90.6%	943	1,042	1,126	1,399	1,708	1,969	2,410	2,887	3,652	93.8%	26.5%
Saudi Arabia	0	0.0%	0	0	0	0	0	0	0	0	0	0.0%	100.0%
Other Middle East	3	0.3%	4	5	4	6	10	6	14	25	26	0.7%	2.1%
Total Middle East	3	0.3%	4	5	4	6	10	6	14	25	26	0.7%	2.0%
Mexico	11	1.4%	11	11	19	23	22	16	15	18	27	0.7%	51.5%
Total Central America	27	3.4%	29	26	40	39	36	24	27	34	44	1.1%	29.5%
Brazil	8	0.9%	5	7	6	8	9	6	8	8	7	0.2%	-12.4%
Total South America	14	1.8%	14	14	11	11	12	9	11	14	15	0.4%	7.3%
Total Latin America	41	5.2%	43	40	50	51	48	33	38	47	58	1.5%	23.1%
South Korea	2	0.2%	2	3	3	3	2	2	3	2	2	0.1%	0.6%
Singapore	0	0.0%	5	1	1	3	9	3	9	27	24	0.6%	-10.1%
Taiwan	0	0.1%	2	2	1	2	2	3	4	4	2	0.0%	-59.8%
Hong Kong	0	0.0%	1	1	2	2	2	2	8	6	7	0.2%	19.5%
Total Asian NICs	3	0.3%	10	6	7	10	16	9	24	39	35	0.9%	-10.3%
Other Asia	22	2.8%	19	23	24	27	28	53	51	85	103	2.7%	22.2%
Total East Asia	25	3.1%	29	30	32	37	43	62	75	123	138	3.6%	11.9%
Total Developing	50	6.2%	60	58	69	72	83	57	85	122	129	3.3%	5.4%
China	21	2.6%	17	21	21	24	26	49	47	79	99	2.6%	25.5%
Soviet Union (former)	0	0.0%	0	0	0	0	0	0	0	0	1	0.0%	465.0%
Eastern Europe	5	0.6%	5	6	8	7	7	10	13	15	15	0.4%	2.4%
Total World	803	100.0%	1,025	1,127	1,223	1,503	1,824	2,085	2,555	3,103	3,895	100.0%	25.5%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Imports For Consumption

TABLE 3.17

U.S. TRADE BALANCE BY COUNTRY
SITC 54 MEDICINAL AND PHARMACEUTICAL PRODUCTS
(Millions of Dollars)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Canada	158	153	155	162	181	211	195	350	435	586
Japan	393	422	434	414	439	531	573	550	512	452
United Kingdom	-6	-94	-64	-48	-84	-159	-172	-234	-358	-366
Germany	1	38	41	59	-6	-3	26	-18	-83	-131
Netherlands	27	31	23	28	36	52	103	154	164	242
France	116	111	91	90	83	125	143	158	159	200
Italy	24	-1	-5	38	-17	36	88	30	130	152
Other EC	162	104	172	221	107	148	155	117	128	-46
Total EC	323	188	259	387	119	199	343	208	140	51
Non-EC West Europe	67	13	-69	-43	-65	-130	-209	-311	-397	-530
Total Western Europe	391	201	190	344	54	69	134	-104	-256	-479
Other Developed Countries	61	71	63	73	79	93	97	107	116	140
Total Developed	1,002	847	843	993	753	905	998	904	807	698
Saudi Arabia	43	51	48	41	50	54	44	44	47	61
Other Middle East	24	23	21	20	13	17	33	18	9	28
Total Middle East	67	74	69	61	63	71	78	62	56	88
Mexico	19	27	35	28	25	35	58	90	102	102
Total Central America	80	90	99	89	80	107	144	170	184	200
Brazil	25	17	14	32	28	23	45	46	65	63
Total South America	128	122	125	153	156	145	134	149	187	236
Total Latin America	208	212	223	242	235	251	278	319	371	437
South Korea	20	20	23	21	26	38	41	49	62	56
Singapore	6	1	6	7	6	3	14	4	-14	-7
Taiwan	19	23	24	31	31	43	39	46	56	69
Hong Kong	21	25	25	23	31	37	37	48	43	45
Total Asian NICs	66	69	78	83	95	121	131	147	147	163
Other Asia	32	34	15	18	30	27	10	26	-5	-16
Total East Asia	99	102	93	101	125	147	141	172	142	148
Total Developing	430	457	463	464	469	551	607	659	715	820
China	-19	-16	-19	-18	-7	-19	-41	-33	-64	-76
Soviet Union (former)	1	1	1	1	1	2	13	25	47	12
Eastern Europe	0	1	2	-1	-1	-2	-2	-6	-1	9
Total World	1,414	1,291	1,290	1,438	1,215	1,437	1,574	1,549	1,503	1,462

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports & Import for Consumption

TABLE 3.18

U.S. EXPORTS BY COUNTRY OF DESTINATION
SITC 55 ESSENTIAL OILS AND PERFUME MATERIALS; TOILET, CLEANSING AND POLISHING PREPARATIONS
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	118	14.8%	116	103	105	140	165	215	401	521	633	24.1%	21.6%
Japan	58	7.2%	74	71	78	125	111	163	249	284	231	8.8%	-18.7%
United Kingdom	58	7.3%	60	66	65	73	101	123	127	143	161	6.1%	12.3%
Germany	34	4.3%	25	24	25	30	40	45	71	88	73	2.8%	-17.0%
Netherlands	24	3.1%	24	24	29	34	43	43	49	67	69	2.6%	2.9%
France	23	2.9%	25	30	24	29	41	48	59	60	63	2.4%	5.6%
Italy	8	1.0%	7	8	9	10	17	23	26	37	40	1.5%	6.8%
Other EC	36	4.5%	30	34	32	34	43	59	78	113	114	4.3%	1.0%
Total EC	183	23.0%	171	186	185	210	286	341	410	508	519	19.7%	2.3%
Non-EC West Europe	15	1.9%	16	19	18	23	31	38	47	49	46	1.7%	-7.9%
Total Western Europe	198	24.9%	187	205	203	233	317	379	457	557	565	21.5%	1.4%
Other Developed Countries	50	6.3%	54	47	56	56	58	78	81	91	105	4.0%	15.0%
Total Developed	423	53.2%	432	426	442	553	651	835	1,189	1,454	1,534	58.3%	5.5%
Saudi Arabia	39	4.9%	31	28	20	24	21	23	33	35	38	1.4%	9.3%
Other Middle East	28	3.5%	27	23	20	22	33	34	36	38	52	2.0%	37.6%
Total Middle East	66	8.3%	58	51	40	46	54	56	69	72	89	3.4%	24.0%
Mexico	18	2.2%	21	25	26	26	35	83	125	112	199	7.6%	77.3%
Total Central America	113	14.3%	123	118	121	127	146	224	265	255	343	13.0%	34.2%
Brazil	10	1.2%	7	7	9	9	10	16	16	21	22	0.9%	8.1%
Total South America	76	9.6%	69	57	67	74	84	96	112	141	181	6.9%	28.1%
Total Latin America	190	23.8%	193	175	189	201	230	320	377	397	524	19.9%	32.0%
South Korea	11	1.4%	14	12	16	19	29	40	51	71	58	2.2%	-17.7%
Singapore	13	1.7%	15	13	15	16	20	31	33	60	54	2.1%	-10.2%
Taiwan	11	1.4%	16	12	21	19	26	36	53	71	105	4.0%	47.2%
Hong Kong	28	3.6%	33	32	35	38	43	50	61	74	85	3.2%	15.0%
Total Asian NICs	64	8.0%	78	69	86	93	118	157	197	276	302	11.5%	9.4%
Other Asia	29	3.7%	26	28	31	33	44	59	77	98	105	4.0%	7.4%
Total East Asia	93	11.7%	105	96	116	126	162	216	274	375	408	15.5%	8.9%
Total Developing	370	46.5%	378	342	361	394	469	620	751	871	1,052	40.0%	20.7%
China	0	0.0%	1	1	2	3	5	7	12	14	12	0.5%	-9.8%
Soviet Union (former)	0	0.0%	0	0	0	0	0	4	6	5	8	0.3%	45.6%
Eastern Europe	2	0.2%	2	2	3	1	1	2	4	16	24	0.9%	45.6%
Total World	795	100.0%	813	772	809	951	1,126	1,469	1,963	2,361	2,631	100.0%	11.4%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports

TABLE 3.19

U.S. IMPORTS BY COUNTRY OF ORIGIN
SITC 55 ESSENTIAL OILS AND PERFUME MATERIALS; TOILET; CLEANSING AND POLISHING PREPARATIONS
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	34	7.9%	41	66	81	79	95	132	166	185	232	15.2%	25.1%
Japan	22	5.2%	29	33	44	56	73	65	64	67	66	4.3%	-1.4%
United Kingdom	30	7.1%	41	61	67	65	83	55	71	87	97	6.3%	10.9%
Germany	43	10.1%	64	67	82	92	101	77	101	98	119	7.8%	21.7%
Netherlands	9	2.1%	9	13	22	18	23	16	13	17	15	1.0%	-7.8%
France	134	31.4%	207	223	231	261	325	344	358	390	474	31.0%	21.6%
Italy	10	2.2%	18	21	27	36	35	28	38	41	47	3.1%	15.2%
Other EC	23	5.4%	33	37	37	44	47	49	50	53	64	4.2%	20.0%
Total EC	249	58.4%	371	422	466	515	614	569	631	686	816	53.4%	19.0%
Non-EC West Europe	25	5.9%	37	38	57	57	70	63	75	71	86	5.6%	21.1%
Total Western Europe	274	64.3%	409	460	522	572	683	632	706	757	902	59.0%	19.2%
Other Developed Countries	1	0.2%	1	2	3	4	3	3	4	6	8	0.5%	39.9%
Total Developed	331	77.6%	480	561	650	710	854	832	940	1,014	1,208	79.0%	19.1%
Saudi Arabia	0	0.0%	0	0	0	0	0	0	0	0	0	0.0%	60.9%
Other Middle East	2	0.4%	3	2	6	5	5	6	6	7	8	0.5%	13.6%
Total Middle East	2	0.4%	3	2	6	5	5	6	7	7	8	0.6%	15.6%
Mexico	17	4.0%	18	17	22	32	37	39	44	52	70	4.6%	33.1%
Total Central America	29	6.8%	31	31	38	46	53	54	58	65	80	5.3%	24.5%
Brazil	8	1.9%	13	16	14	15	24	32	21	21	29	1.9%	38.7%
Total South America	20	4.7%	24	33	36	30	41	50	53	50	60	3.9%	19.0%
Total Latin America	49	11.4%	54	64	74	76	95	104	111	115	140	9.2%	22.1%
South Korea	1	0.3%	2	3	6	6	6	6	8	9	9	0.6%	6.5%
Singapore	2	0.5%	2	3	5	7	7	6	5	3	2	0.1%	-42.9%
Taiwan	2	0.5%	4	13	30	30	28	30	27	45	52	3.4%	17.0%
Hong Kong	1	0.3%	3	3	3	4	5	7	7	5	22	1.5%	320.8%
Total Asian NICs	7	1.7%	12	22	43	48	47	50	46	62	86	5.6%	38.3%
Other Asia	28	6.5%	32	36	31	34	45	32	38	40	49	3.2%	22.1%
Total East Asia	35	8.1%	44	58	74	82	91	81	84	102	135	8.8%	31.9%
Total Developing	79	18.7%	99	125	156	165	186	190	202	228	283	18.5%	23.7%
China	15	3.5%	15	15	16	16	24	20	23	27	33	2.2%	24.2%
Soviet Union (former)	0	0.0%	0	0	0	0	0	0	0	0	2	0.1%	259.0%
Eastern Europe	1	0.3%	1	1	1	1	1	1	1	2	4	0.2%	58.0%
Total World	426	100.0%	595	702	823	893	1,065	1,042	1,167	1,272	1,529	100.0%	20.2%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Imports For Consumption

TABLE 3.20

U.S. TRADE BALANCE BY COUNTRY
SITC 55 ESSENTIAL OILS AND PERFUME MATERIALS; TOILET, CLEANSING AND POLISHING PREPARATIONS
(Millions of Dollars)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Canada	84	76	36	24	61	70	84	235	336	401
Japan	35	45	38	35	69	38	98	185	217	165
United Kingdom	28	19	6	-2	8	18	68	56	56	64
Germany	-9	-39	-42	-56	-62	-61	-32	-30	-10	-46
Netherlands	15	15	10	7	16	20	26	36	50	53
France	-111	-182	-193	-208	-232	-284	-296	-298	-330	-411
Italy	-2	-11	-13	-18	-26	-18	-5	-12	-4	-7
Other EC	13	-3	-3	-5	-10	-3	10	28	60	50
Total EC	-66	-200	-236	-281	-306	-327	-228	-221	-178	-297
Non-EC West Europe	-10	-21	-18	-38	-33	-39	-25	-28	-21	-40
Total Western Europe	-76	-221	-254	-320	-339	-367	-253	-249	-199	-337
Other Developed Countries	49	53	45	53	52	55	75	77	86	97
Total Developed	93	-47	-135	-208	-157	-203	3	248	440	327
Saudi Arabia	39	31	28	20	24	21	23	33	34	37
Other Middle East	26	24	21	14	17	28	27	29	31	44
Total Middle East	65	55	49	34	41	49	50	62	65	81
Mexico	1	3	8	4	-6	-2	44	81	60	130
Total Central America	85	93	88	83	80	92	170	207	191	262
Brazil	2	-6	-9	-4	-7	-14	-16	-6	0	-6
Total South America	56	46	24	32	44	43	46	59	91	121
Total Latin America	141	138	111	114	124	135	216	266	282	383
South Korea	10	12	9	10	13	22	33	43	62	49
Singapore	11	12	10	10	9	12	25	28	57	52
Taiwan	9	12	-1	-9	-11	-2	6	26	26	52
Hong Kong	27	30	28	32	34	38	43	54	69	63
Total Asian NICs	57	67	47	42	46	71	107	151	214	217
Other Asia	2	-6	-8	0	-1	0	27	39	58	56
Total East Asia	58	61	38	42	45	71	135	190	272	273
Total Developing	290	278	217	205	229	283	431	550	643	770
China	-15	-14	-13	-13	-13	-20	-13	-11	-13	-21
Soviet Union (former)	0	0	0	0	0	0	4	6	5	6
Eastern Europe	1	1	1	1	0	0	1	2	14	20
Total World	369	217	70	-13	59	61	427	796	1,089	1,102

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports & Import for Consumption

TABLE 3.21

U.S. EXPORTS BY COUNTRY OF DESTINATION
SITC 56 FERTILIZERS
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	119	8.9%	200	171	106	110	115	245	188	197	196	8.3%	-0.6%
Japan	103	7.7%	156	108	48	73	79	151	160	165	146	6.2%	-11.7%
United Kingdom	1	0.1%	1	1	1	2	1	5	5	7	11	0.5%	56.0%
Germany	24	1.8%	34	30	22	20	12	41	37	27	32	1.3%	18.6%
Netherlands	0	0.0%	19	19	9	10	12	37	35	25	16	0.7%	-35.4%
France	15	1.1%	23	28	19	45	39	70	57	56	46	2.0%	-17.2%
Italy	34	2.5%	56	36	23	35	22	33	15	13	9	0.4%	-30.0%
Other EC	158	11.8%	178	108	60	103	67	171	121	103	25	1.1%	-75.4%
Total EC	232	17.4%	310	222	133	214	154	357	270	231	140	5.9%	-39.6%
Non-EC West Europe	35	2.6%	63	58	35	48	33	73	88	59	16	0.7%	-73.5%
Total Western Europe	267	20.0%	374	280	168	262	187	430	358	290	155	6.5%	-46.5%
Other Developed Countries	85	6.4%	100	80	33	43	44	141	152	162	158	6.7%	-2.2%
Total Developed	573	43.0%	830	640	356	488	425	967	857	814	655	27.6%	-19.5%
Saudi Arabia	2	0.2%	4	1	5	8	8	5	15	17	1	0.1%	-92.7%
Other Middle East	0	0.0%	4	5	1	10	27	24	41	2	47	2.0%	818.0%
Total Middle East	3	0.2%	8	6	5	18	35	29	56	18	48	2.0%	166.0%
Mexico	51	3.9%	82	55	24	24	13	55	44	49	77	3.3%	56.7%
Total Central America	115	8.6%	143	125	55	51	44	135	123	141	167	7.0%	18.3%
Brazil	19	1.4%	87	45	75	51	47	52	71	104	105	4.4%	1.0%
Total South America	112	8.4%	230	159	146	144	153	259	235	278	287	12.1%	3.5%
Total Latin America	226	17.0%	373	284	201	195	197	394	358	419	454	19.1%	8.5%
South Korea	3	0.2%	48	46	29	31	34	62	82	75	78	3.3%	3.3%
Singapore	13	1.0%	5	0	2	0	0	0	1	0	0	0.0%	24.9%
Taiwan	60	4.5%	116	24	1	3	1	2	2	4	14	0.6%	294.3%
Hong Kong	0	0.0%	6	22	0	1	2	7	5	0	0	0.0%	-48.2%
Total Asian NICs	76	5.7%	176	93	32	37	38	71	90	80	93	3.9%	16.0%
Other Asia	219	16.5%	338	170	61	149	201	514	576	1,015	707	29.8%	-30.4%
Total East Asia	295	22.2%	513	263	92	185	239	585	666	1,095	799	33.7%	-27.0%
Total Developing	504	37.9%	1,001	835	379	337	475	1,099	960	1,058	1,972	45.2%	1.3%
China	168	12.6%	267	139	46	130	182	487	544	982	629	26.5%	-35.9%
Soviet Union (former)	58	4.3%	47	100	126	110	107	237	201	124	11	0.5%	-91.5%
Eastern Europe	29	2.2%	58	36	23	20	10	31	12	2	1	0.1%	-51.5%
Total World	1,332	100.0%	2,203	1,750	929	1,084	1,199	2,821	2,575	2,980	2,372	100.0%	-20.4%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports

TABLE 3.22

U.S. IMPORTS BY COUNTRY OF ORIGIN
SITC 56 FERTILIZERS
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	735	75.2%	836	666	569	579	715	708	751	723	762	80.0%	5.5%
Japan	4	0.4%	5	5	3	3	4	10	7	7	6	0.7%	-13.3%
United Kingdom	1	0.1%	1	1	1	3	4	3	1	1	1	0.1%	6.7%
Germany	15	1.6%	20	18	17	19	32	18	22	30	20	2.1%	-34.9%
Netherlands	44	4.5%	34	53	39	27	27	33	26	20	10	1.0%	-51.7%
France	0	0.0%	0	0	0	0	4	2	3	3	3	0.3%	-3.8%
Italy	0	0.0%	6	7	10	6	13	6	6	0	10	1.1%	675.0%
Other EC	11	1.2%	16	12	8	6	11	8	10	7	12	1.3%	64.5%
Total EC	72	7.4%	77	91	76	60	91	70	68	62	56	5.9%	-9.8%
Non-EC West Europe	9	0.9%	11	14	8	14	17	26	20	28	22	2.4%	-19.1%
Total Western Europe	81	8.3%	88	104	85	74	108	96	88	90	78	8.2%	-12.7%
Other Developed Countries	2	0.2%	3	8	5	3	4	0	0	0	0	0.0%	276.0%
Total Developed	822	84.1%	931	784	661	660	832	814	845	820	847	88.9%	3.3%
Saudi Arabia	0	0.0%	0	0	4	0	0	2	3	3	0	0.0%	100.0%
Other Middle East	51	5.2%	39	41	26	35	28	52	30	20	13	1.4%	-32.5%
Total Middle East	51	5.2%	39	41	30	35	28	54	34	23	13	1.4%	-42.2%
Mexico	8	0.8%	4	1	3	6	3	10	15	15	13	1.4%	-13.0%
Total Central America	12	1.2%	7	8	14	23	29	23	30	30	24	2.5%	-20.9%
Brazil	5	0.6%	0	1	0	0	0	5	2	0	2	0.2%	588.2%
Total South America	24	2.5%	12	4	6	8	20	25	20	14	17	1.8%	24.9%
Total Latin America	37	3.7%	19	12	20	32	48	47	50	44	41	4.3%	-6.6%
South Korea	0	0.0%	0	0	0	0	0	0	1	0	0	0.0%	-11.8%
Singapore	0	0.0%	0	0	0	0	0	0	0	0	0	0.0%	
Taiwan	0	0.0%	0	0	0	0	0	0	0	0	0	0.0%	196.3%
Hong Kong	0	0.0%	0	0	0	0	0	0	0	0	0	0.0%	-80.9%
Total Asian NICs	0	0.0%	0	0	0	0	0	0	1	0	0	0.0%	56.8%
Other Asia	1	0.1%	0	0	6	7	5	15	0	1	0	0.0%	-91.1%
Total East Asia	1	0.1%	0	0	6	7	5	15	1	2	0	0.0%	-79.6%
Total Developing	89	9.1%	60	54	55	80	106	123	86	71	55	5.8%	-22.1%
China	0	0.0%	0	0	0	1	0	2	0	0	0	0.0%	-17.0%
Soviet Union (former)	43	4.4%	54	57	60	11	24	9	1	17	44	4.7%	163.4%
Eastern Europe	24	2.5%	75	50	61	17	29	52	22	12	6	0.6%	-48.8%
Total World	977	100.0%	1,119	945	837	768	991	999	955	919	952	100.0%	3.6%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Imports For Consumption

TABLE 3.23

U.S. TRADE BALANCE BY COUNTRY
SITC 56 FERTILIZERS
(Millions of Dollars)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Canada	-616	-635	-495	-463	-469	-600	-463	-563	-526	-567
Japan	99	151	103	45	70	76	141	153	158	139
United Kingdom	0	0	-1	-1	-1	-4	2	4	6	10
Germany	9	13	12	4	1	-19	23	15	-4	12
Netherlands	-44	-15	-34	-30	-17	-15	4	9	5	7
France	15	23	28	19	45	36	68	53	53	43
Italy	34	50	29	13	28	9	27	9	13	-1
Other EC	146	163	96	52	97	56	163	111	95	13
Total EC	160	233	131	57	154	62	287	202	169	84
Non-EC West Europe	26	53	45	25	34	16	47	68	31	-7
Total Western Europe	186	286	176	84	188	79	334	270	200	77
Other Developed Countries	83	98	73	28	40	39	141	152	162	158
Total Developed	-248	-101	-144	-306	-171	-406	153	12	-6	-192
Saudi Arabia	2	4	1	1	8	8	4	12	13	1
Other Middle East	-51	-35	-36	-25	-25	-2	-29	10	-18	34
Total Middle East	-48	-31	-35	-25	-17	6	-25	22	-5	35
Mexico	44	78	54	22	19	10	45	29	34	64
Total Central America	103	136	117	41	28	15	112	93	111	143
Brazil	13	86	45	75	50	46	47	69	104	103
Total South America	87	218	155	140	136	134	234	214	264	270
Total Latin America	190	354	272	181	164	149	347	308	374	413
South Korea	3	48	46	29	31	34	61	81	75	78
Singapore	13	5	0	2	0	0	0	1	0	0
Taiwan	60	116	24	1	3	1	2	1	3	14
Hong Kong	0	6	22	0	1	2	7	5	0	0
Total Asian NICs	76	176	93	32	37	38	71	89	80	92
Other Asia	218	338	170	55	142	196	499	576	1,014	707
Total East Asia	294	513	262	87	179	234	570	665	1,094	799
Total Developing	416	942	781	324	257	369	976	874	987	1,017
China	168	267	139	46	129	182	486	544	982	629
Soviet Union (former)	15	-7	43	66	99	83	228	200	107	-34
Eastern Europe	5	-17	-14	-38	3	-19	-21	-10	-9	-5
Total World	355	1,084	805	92	317	208	1,822	1,619	2,061	1,420

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports & Import for Consumption

TABLE 3.24

U.S. EXPORTS BY COUNTRY OF DESTINATION
SITC 57 PLASTICS IN PRIMARY FORM
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	381	13.9%	394	374	387	552	625	704	1,175	1,267	1,422	19.8%	12.3%
Japan	252	9.2%	276	223	234	294	397	443	447	517	458	6.4%	-11.4%
United Kingdom	120	4.4%	134	113	122	149	172	230	256	235	226	3.2%	-3.6%
Germany	61	2.2%	66	8[illegible]	110	110	138	180	204	221	199	2.8%	-10.2%
Netherlands	137	5.0%	196	198	196	207	311	370	478	521	543	7.6%	4.1%
France	36	1.3%	31	34	40	46	55	81	83	74	77	1.1%	3.9%
Italy	20	0.7%	30	29	34	49	62	74	55	63	53	0.7%	-16.0%
Other EC	213	7.8%	232	229	261	300	388	462	526	594	557	7.8%	-6.2%
Total EC	588	21.5%	689	691	763	861	1,125	1,397	1,603	1,708	1,654	23.1%	-3.1%
Non-EC West Europe	41	1.5%	29	34	37	46	57	69	89	97	90	1.3%	-7.8%
Total Western Europe	628	23.0%	718	725	800	907	1,183	1,466	1,692	1,805	1,744	24.3%	-3.4%
Other Developed Countries	118	4.3%	129	121	126	174	230	278	219	257	252	3.5%	-2.0%
Total Developed	1,379	50.4%	1,517	1,443	1,547	1,927	2,434	2,891	3,533	3,845	3,875	54.0%	0.8%
Saudi Arabia	40	1.4%	37	30	20	19	30	21	22	42	33	0.5%	-21.1%
Other Middle East	18	0.7%	18	25	19	25	35	45	60	82	89	1.3%	9.3%
Total Middle East	57	2.1%	55	55	39	45	65	67	82	124	123	1.7%	-1.0%
Mexico	230	8.4%	209	250	264	296	409	542	533	600	668	9.3%	11.2%
Total Central America	355	13.0%	330	360	387	463	637	774	775	836	909	12.7%	8.7%
Brazil	49	1.8%	40	44	55	53	59	99	84	116	113	1.6%	-2.7%
Total South America	214	7.8%	233	203	278	353	411	371	376	568	538	7.5%	-5.4%
Total Latin America	569	20.8%	563	564	665	815	1,049	1,145	1,151	1,404	1,446	20.2%	3.0%
South Korea	95	3.5%	102	80	121	183	212	242	264	312	276	3.8%	-11.6%
Singapore	55	2.0%	44	27	42	67	99	141	143	201	224	3.1%	11.4%
Taiwan	97	3.5%	93	67	119	210	282	284	255	360	299	4.2%	-16.9%
Hong Kong	87	3.2%	94	82	146	238	432	316	360	462	390	5.4%	-15.6%
Total Asian NICs	333	12.2%	332	256	428	698	1,025	983	1,022	1,335	1,189	16.6%	-10.9%
Other Asia	327	12.0%	396	345	362	443	798	434	420	542	407	5.7%	-24.9%
Total East Asia	661	24.1%	728	601	790	1,141	1,824	1,416	1,442	1,877	1,596	22.2%	-15.0%
Total Developing	1,263	46.1%	1,171	1,056	1,380	1,863	2,488	2,620	2,729	3,372	3,094	43.1%	-8.2%
China	92	3.4%	234	226	191	239	575	197	151	268	199	2.8%	-25.6%
Soviet Union (former)	3	0.1%	4	3	2	1	1	10	13	48	7	0.1%	-86.4%
Eastern Europe	1	0.0%	1	2	1	2	4	8	2	4	2	0.0%	-39.2%
Total World	2,737	100.0%	2,926	2,730	3,121	4,033	5,503	5,727	6,429	7,537	7,178	100.0%	-4.8%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports

TABLE 3.25

U.S. IMPORTS BY COUNTRY OF ORIGIN
SITC 57 PLASTICS IN PRIMARY FORM
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	90	16.6%	143	184	227	280	445	495	610	607	761	34.0%	25.4%
Japan	141	26.3%	179	184	189	217	217	304	315	319	372	16.6%	16.6%
United Kingdom	35	6.6%	50	60	88	85	104	138	130	113	119	5.3%	5.4%
Germany	95	17.7%	119	121	149	173	184	231	243	269	299	13.3%	11.0%
Netherlands	18	3.3%	29	43	42	43	52	60	73	73	103	4.6%	41.6%
France	39	7.3%	50	67	69	63	70	86	94	98	111	4.9%	12.7%
Italy	13	2.4%	19	22	26	27	26	45	63	69	83	3.7%	21.0%
Other EC	15	2.8%	26	28	33	35	37	77	79	68	84	3.8%	24.8%
Total EC	215	40.0%	292	342	407	426	473	639	681	690	799	35.7%	15.9%
Non-EC West Europe	14	2.6%	21	25	28	31	36	58	73	73	84	3.8%	14.8%
Total Western Europe	229	42.6%	313	367	436	457	509	696	754	763	883	39.4%	15.8%
Other Developed Countries	0	0.0%	0	1	1	0	1	2	1	1	2	0.1%	109.8%
Total Developed	460	85.5%	635	735	853	955	1,171	1,497	1,680	1,690	2,019	90.1%	19.5%
Saudi Arabia	0	0.0%	0	1	2	0	0	0	0	0	0	0.0%	
Other Middle East	6	1.2%	7	10	10	17	17	16	16	15	7	0.3%	-51.3%
Total Middle East	6	1.2%	7	11	12	17	17	16	16	15	7	0.3%	-51.3%
Mexico	21	3.8%	35	36	35	49	63	34	31	45	71	3.2%	56.6%
Total Central America	21	3.8%	35	36	35	49	64	34	32	46	71	3.2%	56.0%
Brazil	8	1.4%	36	12	16	11	21	28	36	23	26	1.2%	12.0%
Total South America	22	4.1%	58	25	29	18	41	54	60	33	35	1.6%	8.6%
Total Latin America	43	7.9%	93	61	64	67	104	88	92	78	106	4.7%	36.2%
South Korea	5	0.9%	7	8	11	12	6	14	63	46	23	1.1%	-49.2%
Singapore	0	0.0%	0	0	0	0	1	2	44	28	3	0.1%	-90.7%
Taiwan	21	3.9%	23	29	43	45	44	47	51	50	63	2.8%	25.7%
Hong Kong	0	0.0%	1	1	1	1	1	1	1	1	1	0.1%	148.3%
Total Asian NICs	26	4.8%	31	39	56	58	52	64	158	125	90	4.0%	-27.8%
Other Asia	2	0.5%	5	2	3	4	8	10	14	10	12	0.5%	26.8%
Total East Asia	29	5.3%	36	40	59	61	60	74	172	134	102	4.6%	-23.9%
Total Developing	75	13.9%	131	111	133	143	174	170	271	221	209	9.3%	-5.4%
China	2	0.4%	5	2	3	3	8	9	12	9	10	0.5%	15.6%
Soviet Union (former)	0	0.0%	0	0	0	0	0	0	0	0	0	0.0%	
Eastern Europe	1	0.1%	3	4	2	1	3	1	5	3	3	0.2%	23.3%
Total World	538	100.0%	774	852	992	1,102	1,357	1,677	1,968	1,922	2,241	100.0%	16.6%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Imports For Consumption

TABLE 3.26

U.S. TRADE BALANCE BY COUNTRY
SITC 57 PLASTICS IN PRIMARY FORM
(Millions of Dollars)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Canada	291	251	190	160	272	181	209	565	660	661
Japan	111	97	39	45	77	179	140	132	197	85
United Kingdom	85	84	53	34	64	68	92	126	122	107
Germany	-34	-53	-33	-39	-63	-47	-51	-38	-48	-100
Netherlands	120	167	155	154	164	259	310	405	448	439
France	-3	-18	-34	-29	-17	-15	-5	-10	-24	-34
Italy	7	11	7	8	22	36	29	-8	-6	-30
Other EC	198	207	201	228	265	351	384	447	526	472
Total EC	372	397	349	356	436	653	759	922	1,018	855
Non-EC West Europe	27	8	8	8	15	21	11	16	24	5
Total Western Europe	399	405	358	364	450	674	770	938	1,042	860
Other Developed Countries	118	129	121	125	173	229	276	218	256	250
Total Developed	919	882	708	694	972	1,263	1,394	1,853	2,155	1,856
Saudi Arabia	40	37	29	18	19	30	21	22	42	33
Other Middle East	12	10	15	8	9	18	29	44	67	82
Total Middle East	51	48	44	27	28	48	51	65	109	115
Mexico	210	174	215	230	247	346	508	502	555	597
Total Central America	334	295	324	352	413	574	740	743	790	838
Brazil	42	4	32	39	42	38	71	48	93	87
Total South America	192	175	179	249	335	371	317	316	536	502
Total Latin America	526	470	503	601	748	944	1,057	1,058	1,326	1,340
South Korea	90	95	72	110	171	205	228	201	266	252
Singapore	55	44	27	42	67	98	139	100	172	221
Taiwan	76	70	38	75	165	238	237	204	310	236
Hong Kong	87	93	81	145	237	432	315	359	462	389
Total Asian NICs	307	301	217	372	640	974	919	864	1,210	1,099
Other Asia	325	391	344	358	440	790	424	406	532	395
Total East Asia	632	692	561	730	1,080	1,764	1,343	1,269	1,742	1,493
Total Developing	1,188	1,039	945	1,247	1,720	2,314	2,450	2,458	3,152	2,886
China	90	229	225	188	236	567	188	140	259	189
Soviet Union (former)	3	4	3	2	1	1	10	12	48	6
Eastern Europe	1	-2	-3	-1	1	1	7	-3	1	-1
Total World	2,199	2,152	1,878	2,129	2,931	4,146	4,050	4,461	5,614	4,936

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports & Import for Consumption

TABLE 3.27

U.S. EXPORTS BY COUNTRY OF DESTINATION
SITC 58 PLASTICS IN NON-PRIMARY FORM
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	328	26.3%	350	304	291	395	445	433	735	756	853	27.7%	12.7%
Japan	96	7.7%	103	103	112	141	162	188	195	194	173	5.6%	-10.6%
United Kingdom	66	5.3%	79	76	88	90	113	135	135	124	133	4.3%	7.7%
Germany	59	4.7%	72	72	102	98	132	100	142	122	148	4.8%	21.0%
Netherlands	23	1.9%	26	33	44	51	63	87	115	122	123	4.0%	0.9%
France	40	3.2%	42	39	41	51	51	60	69	80	77	2.5%	-2.7%
Italy	14	1.1%	17	19	19	23	29	47	58	45	41	1.3%	-10.0%
Other EC	104	8.4%	122	100	108	132	131	188	182	190	201	6.6%	6.0%
Total EC	307	24.6%	358	338	403	446	519	616	700	683	724	23.5%	6.0%
Non-EC West Europe	32	2.5%	36	32	39	41	47	57	57	45	46	1.5%	0.4%
Total Western Europe	338	27.1%	395	370	441	488	567	673	757	728	769	25.0%	5.7%
Other Developed Countries	84	6.7%	98	79	88	101	117	139	142	138	137	4.4%	-1.2%
Total Developed	846	67.8%	946	856	933	1,124	1,290	1,432	1,829	1,817	1,932	62.8%	6.4%
Saudi Arabia	42	3.4%	24	16	9	10	15	18	20	32	33	1.1%	3.3%
Other Middle East	11	0.9%	11	10	13	14	14	19	19	25	26	0.8%	4.3%
Total Middle East	53	4.3%	35	26	22	24	29	37	39	57	59	1.9%	3.8%
Mexico	71	5.7%	103	136	145	184	277	281	320	354	481	15.7%	36.1%
Total Central America	119	9.5%	152	178	185	228	326	342	374	416	547	17.8%	31.6%
Brazil	16	1.3%	22	20	28	21	28	34	34	50	39	1.3%	-22.6%
Total South America	78	6.3%	86	62	77	72	81	86	96	136	143	4.6%	4.9%
Total Latin America	197	15.8%	238	240	262	300	408	427	470	552	690	22.4%	25.0%
South Korea	11	0.9%	17	11	14	25	41	47	62	71	73	2.4%	3.0%
Singapore	13	1.0%	15	16	15	18	24	58	43	42	55	1.8%	31.6%
Taiwan	9	0.8%	11	10	19	29	38	42	46	57	68	2.2%	18.6%
Hong Kong	14	1.1%	13	14	19	26	51	44	49	60	71	2.3%	18.2%
Total Asian NICs	48	3.8%	55	52	67	98	154	191	200	230	266	8.7%	16.1%
Other Asia	19	1.6%	20	16	19	33	45	45	50	68	80	2.6%	17.2%
Total East Asia	67	5.4%	75	67	86	131	199	236	250	298	347	11.3%	16.4%
Total Developing	335	26.9%	368	345	381	454	633	716	773	915	1,112	36.2%	21.5%
China	1	0.1%	2	3	4	16	21	16	11	20	18	0.6%	-8.2%
Soviet Union (former)	64	5.1%	57	66	59	65	55	37	18	28	8	0.3%	-70.5%
Eastern Europe	2	0.1%	2	2	10	1	2	1	2	5	5	0.2%	-9.5%
Total World	1,247	100.0%	1,374	1,272	1,387	1,660	2,001	2,202	2,633	2,786	3,076	100.0%	10.4%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports

TABLE 3.28

U.S. IMPORTS BY COUNTRY OF ORIGIN
SITC 58 PLASTICS IN NON-PRIMARY FORM
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	150	20.1%	197	196	226	262	347	356	403	452	536	26.2%	18.5%
Japan	133	17.8%	178	199	242	273	323	336	370	373	416	20.4%	11.4%
United Kingdom	62	8.3%	56	58	62	76	98	91	109	114	123	6.1%	8.1%
Germany	107	14.3%	119	123	141	147	168	189	207	208	224	11.0%	7.5%
Netherlands	4	0.5%	7	10	11	14	20	19	22	18	22	1.1%	20.6%
France	17	2.3%	27	27	37	34	31	45	43	43	47	2.3%	8.6%
Italy	34	4.5%	43	42	43	45	57	49	40	43	43	2.1%	0.6%
Other EC	32	4.3%	38	46	43	57	49	51	58	55	59	2.9%	8.1%
Total EC	256	34.2%	290	305	337	373	424	444	478	481	518	25.4%	7.7%
Non-EC West Europe	25	3.3%	35	34	40	42	47	52	61	55	56	2.8%	2.2%
Total Western Europe	281	37.6%	325	338	377	415	470	496	539	536	574	28.1%	7.1%
Other Developed Countries	0	0.0%	1	3	4	4	5	4	7	9	5	0.2%	-47.8%
Total Developed	565	75.4%	702	737	849	954	1,146	1,192	1,319	1,370	1,530	74.9%	11.7%
Saudi Arabia	0	0.0%	0	0	0	0	0	0	0	0	0	0.0%	
Other Middle East	8	1.0%	16	21	24	25	28	36	37	36	40	1.9%	10.4%
Total Middle East	8	1.0%	16	21	24	25	28	36	37	36	40	2.0%	10.5%
Mexico	15	2.0%	23	32	45	49	57	59	76	79	76	3.7%	-3.3%
Total Central America	15	2.0%	23	33	47	51	59	62	81	82	80	3.9%	-2.3%
Brazil	7	0.9%	13	13	13	13	29	21	24	19	26	1.3%	35.0%
Total South America	14	1.9%	21	22	21	23	39	46	50	47	57	2.8%	22.9%
Total Latin America	29	3.9%	44	55	68	74	98	108	131	128	137	6.7%	6.9%
South Korea	8	1.1%	17	24	39	49	79	74	77	82	102	5.0%	25.0%
Singapore	0	0.0%	0	1	2	3	3	6	7	11	8	0.4%	-28.0%
Taiwan	130	17.4%	152	144	152	172	183	194	182	199	192	9.4%	-3.7%
Hong Kong	2	0.3%	3	3	3	3	3	2	2	3	3	0.2%	-2.7%
Total Asian NICs	140	18.8%	173	171	196	227	268	275	269	294	304	14.9%	3.3%
Other Asia	5	0.7%	7	9	8	12	16	12	13	17	25	1.2%	49.9%
Total East Asia	146	19.5%	180	180	204	239	284	288	282	311	330	16.1%	5.9%
Total Developing	183	24.4%	242	257	296	338	410	434	453	477	506	24.8%	6.3%
China	0	0.0%	0	0	1	1	1	1	1	3	5	0.2%	68.8%
Soviet Union (former)	0	0.0%	0	0	0	0	0	0	0	0	0	0.0%	
Eastern Europe	1	0.1%	1	1	1	1	1	1	1	1	1	0.0%	-49.1%
Total World	749	100.0%	945	994	1,146	1,294	1,558	1,628	1,775	1,851	2,042	100.0%	10.3%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Imports For Consumption

TABLE 3.29

U.S. TRADE BALANCE BY COUNTRY
SITC 58 PLASTICS IN NON-PRIMARY FORM
(Millions of Dollars)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Canada	178	153	108	66	133	99	77	331	304	317
Japan	-37	-75	-96	-130	-132	-162	-148	-175	-179	-242
United Kingdom	4	23	18	27	14	16	44	26	9	10
Germany	-48	-46	-51	-39	-48	-36	-89	-66	-86	-76
Netherlands	19	19	23	33	38	43	67	93	104	102
France	23	15	12	4	16	20	15	26	37	31
Italy	-20	-26	-23	-24	-22	-28	-2	18	2	-2
Other EC	73	84	54	65	75	81	137	124	135	142
Total EC	50	68	34	66	73	96	172	222	202	206
Non-EC West Europe	7	1	-1	-1	-1	1	5	-3	-10	-11
Total Western Europe	57	69	32	64	72	96	177	218	192	195
Other Developed Countries	84	97	75	84	97	111	135	135	129	132
Total Developed	281	245	119	84	170	144	240	510	447	402
Saudi Arabia	42	24	16	9	10	15	18	20	32	33
Other Middle East	4	-5	-11	-11	-11	-14	-17	-18	-11	-14
Total Middle East	45	19	5	-1	-1	1	1	2	21	19
Mexico	56	80	104	100	136	221	222	244	275	405
Total Central America	104	129	145	138	177	268	280	294	334	467
Brazil	10	9	7	15	8	-1	13	9	31	13
Total South America	64	65	40	56	49	42	40	46	89	85
Total Latin America	168	194	185	194	226	310	320	339	424	553
South Korea	3	-1	-12	-25	-25	-38	-26	-16	-11	-29
Singapore	13	14	15	13	16	22	52	36	31	47
Taiwan	-120	-142	-133	-133	-143	-145	-153	-137	-142	-124
Hong Kong	12	10	12	16	23	49	42	47	57	68
Total Asian NICs	-93	-118	-120	-129	-129	-113	-84	-69	-65	-38
Other Asia	14	13	7	11	21	29	32	37	51	55
Total East Asia	-79	-105	-113	-118	-108	-85	-52	-33	-13	17
Total Developing	152	126	88	85	116	223	282	320	439	606
China	1	2	3	3	14	20	16	10	17	13
Soviet Union (former)	64	57	66	59	65	55	37	18	28	8
Eastern Europe	1	1	2	10	0	1	0	1	4	4
Total World	498	430	277	241	366	442	574	858	935	1,033

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports & Import for Consumption

TABLE 3.30

U.S. EXPORTS BY COUNTRY OF DESTINATION
SITC 59 CHEMICAL MATERIALS AND PRODUCTS NES
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	392	15.0%	464	444	394	461	567	694	1,097	1,203	1,285	20.2%	6.8%
Japan	254	9.7%	273	289	293	307	358	536	564	659	697	11.0%	5.7%
United Kingdom	96	3.7%	100	101	103	153	196	224	208	259	388	6.1%	49.8%
Germany	73	2.8%	84	84	95	95	125	147	270	350	417	6.6%	19.1%
Netherlands	133	5.1%	122	102	122	144	180	179	266	312	194	3.1%	-37.7%
France	78	3.0%	69	82	95	124	161	199	300	255	327	5.1%	28.3%
Italy	34	1.3%	38	37	50	44	57	65	110	137	167	2.6%	21.8%
Other EC	223	8.5%	233	235	296	340	391	425	452	414	430	6.8%	4.0%
Total EC	637	24.4%	646	641	763	899	1,110	1,239	1,607	1,727	1,924	30.2%	11.4%
Non-EC West Europe	80	3.1%	73	56	70	83	102	117	126	119	141	2.2%	18.1%
Total Western Europe	717	27.5%	719	697	833	982	1,212	1,356	1,733	1,847	2,065	32.5%	11.8%
Other Developed Countries	174	6.7%	240	157	167	204	241	314	247	251	268	4.2%	6.6%
Total Developed	1,537	58.9%	1,696	1,586	1,689	1,955	2,378	2,899	3,641	3,961	4,315	67.8%	9.0%
Saudi Arabia	53	2.0%	52	37	39	54	44	51	69	80	56	0.9%	-29.9%
Other Middle East	40	1.5%	48	59	41	49	66	81	92	69	73	1.2%	5.9%
Total Middle East	92	3.5%	100	96	80	103	111	132	161	149	129	2.0%	-13.3%
Mexico	83	3.2%	98	109	103	104	130	208	252	311	321	5.1%	3.3%
Total Central America	190	7.3%	223	206	202	200	232	323	402	460	478	7.5%	4.0%
Brazil	110	4.2%	86	73	103	84	96	106	108	111	100	1.6%	-10.0%
Total South America	330	12.7%	344	295	353	356	393	465	443	517	490	7.7%	-5.3%
Total Latin America	520	19.9%	567	500	554	556	625	788	844	977	968	15.2%	-0.9%
South Korea	46	1.8%	46	36	52	58	80	167	206	202	216	3.4%	7.1%
Singapore	97	3.7%	113	95	99	121	123	156	175	174	183	2.9%	5.4%
Taiwan	42	1.6%	39	32	41	57	60	95	94	104	137	2.2%	30.9%
Hong Kong	22	0.8%	31	24	24	45	59	38	40	50	55	0.9%	10.3%
Total Asian NICs	206	7.9%	229	187	216	282	322	455	515	529	590	9.3%	11.5%
Other Asia	147	5.6%	116	81	85	107	147	186	195	227	203	3.2%	-10.7%
Total East Asia	353	13.5%	345	268	302	389	469	641	710	756	793	12.5%	4.9%
Total Developing	1,014	38.9%	1,101	943	1,002	1,110	1,274	1,633	1,792	1,951	1,966	30.9%	0.8%
China	37	1.4%	20	23	24	29	40	37	33	50	46	0.7%	-7.9%
Soviet Union (former)	6	0.2%	8	10	8	8	19	9	4	51	27	0.4%	-47.5%
Eastern Europe	7	0.3%	14	10	9	6	8	5	7	8	9	0.2%	24.3%
Total World	2,608	100.0%	2,849	2,581	2,742	3,118	3,725	4,583	5,478	6,020	6,363	100.0%	5.7%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports

TABLE 3.31

U.S. IMPORTS BY COUNTRY OF ORIGIN
SITC 59 CHEMICAL MATERIALS AND PRODUCTS NES
(Millions of Dollars)

	1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
Canada	99	10.3%	118	126	144	166	172	201	237	305	413	15.8%	35.6%
Japan	107	11.2%	143	146	193	234	289	195	251	279	347	13.3%	24.4%
United Kingdom	50	5.3%	59	80	93	105	116	159	158	200	245	9.4%	22.6%
Germany	95	10.0%	127	120	146	204	232	293	341	325	384	14.7%	18.1%
Netherlands	35	3.7%	43	50	61	61	71	97	107	86	120	4.6%	38.8%
France	53	5.6%	57	55	74	89	113	119	127	137	190	7.3%	39.0%
Italy	12	1.3%	29	25	29	32	30	36	42	42	37	1.4%	-12.1%
Other EC	70	7.4%	77	114	110	137	178	216	207	170	255	9.8%	49.9%
Total EC	317	33.1%	391	444	513	628	740	921	982	961	1,232	47.2%	28.2%
Non-EC West Europe	43	4.5%	46	72	61	68	67	61	83	98	99	3.8%	1.1%
Total Western Europe	360	37.6%	437	517	574	695	807	982	1,065	1,059	1,331	51.0%	25.7%
Other Developed Countries	124	13.0%	136	117	126	114	124	162	181	168	157	6.0%	-6.4%
Total Developed	690	72.1%	834	905	1,037	1,210	1,392	1,540	1,734	1,810	2,248	86.2%	24.2%
Saudi Arabia	0	0.0%	0	0	0	0	0	0	0	0	0	0.0%	
Other Middle East	10	1.1%	1	16	5	5	10	7	13	9	17	0.7%	98.8%
Total Middle East	10	1.1%	1	16	5	5	10	8	13	9	17	0.7%	98.8%
Mexico	6	0.7%	135	138	19	12	16	26	49	55	58	2.2%	6.6%
Total Central America	9	1.0%	138	149	26	14	21	27	52	56	64	2.5%	15.1%
Brazil	10	1.0%	19	96	24	22	31	27	24	29	35	1.3%	20.7%
Total South America	162	17.0%	38	119	51	49	73	46	49	47	54	2.1%	14.4%
Total Latin America	172	17.9%	176	268	77	63	95	73	100	102	118	4.5%	14.8%
South Korea	1	0.1%	3	1	7	7	4	2	4	3	12	0.5%	257.2%
Singapore	1	0.1%	2	2	1	0	3	0	0	5	4	0.2%	-22.2%
Taiwan	6	0.7%	6	11	9	8	10	11	11	11	11	0.4%	-2.8%
Hong Kong	3	0.3%	4	6	9	11	10	5	6	7	5	0.2%	-26.2%
Total Asian NICs	11	1.2%	17	20	25	27	26	18	22	26	32	1.2%	22.6%
Other Asia	67	7.0%	110	92	95	104	98	123	129	141	151	5.8%	7.4%
Total East Asia	78	8.1%	126	112	120	130	124	142	151	167	183	7.0%	9.7%
Total Developing	224	23.4%	267	354	154	143	181	166	208	213	239	9.2%	12.2%
China	38	4.0%	38	45	52	60	53	61	62	71	87	3.3%	23.4%
Soviet Union (former)	1	0.1%	0	0	1	0	1	0	1	4	13	0.5%	222.3%
Eastern Europe	4	0.4%	4	74	45	10	18	11	15	18	22	0.8%	24.3%
Total World	957	100.0%	1,144	1,378	1,289	1,423	1,645	1,778	2,018	2,115	2,609	100.0%	23.3%

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Imports For Consumption.

TABLE 3.32

U.S. TRADE BALANCE BY COUNTRY
SITC 59 CHEMICAL MATERIALS AND PRODUCTS NES
(Millions of Dollars)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Canada	293	346	318	250	295	395	492	860	898	872
Japan	147	130	143	101	73	69	341	313	380	350
United Kingdom	46	41	21	10	48	80	65	50	59	143
Germany	-23	-43	-36	-51	-109	-107	-147	-72	26	34
Netherlands	97	79	52	61	83	109	82	159	225	74
France	24	12	27	22	36	48	80	173	118	137
Italy	22	10	12	21	12	27	30	68	95	130
Other EC	152	156	121	186	203	213	208	245	244	175
Total EC	319	255	196	250	272	370	318	624	767	692
Non-EC West Europe	37	27	-16	9	15	35	55	43	21	42
Total Western Europe	357	282	181	259	287	405	373	668	788	734
Other Developed Countries	50	104	39	42	91	117	152	66	84	111
Total Developed	847	862	681	651	745	986	1,359	1,908	2,150	2,067
Saudi Arabia	53	52	37	39	54	44	51	69	80	56
Other Middle East	30	46	43	36	44	56	74	79	60	56
Total Middle East	82	98	80	75	98	101	125	148	141	112
Mexico	76	-37	-29	84	92	113	181	203	256	263
Total Central America	181	85	57	176	186	211	296	350	404	414
Brazil	100	68	-23	79	62	65	79	83	83	66
Total South America	167	306	176	301	307	319	419	394	470	436
Total Latin America	348	390	233	477	493	530	715	744	874	850
South Korea	45	43	35	45	51	76	165	202	198	203
Singapore	95	110	93	99	121	120	155	175	169	179
Taiwan	36	32	21	32	49	50	84	83	93	126
Hong Kong	19	27	18	16	35	50	33	33	43	50
Total Asian NICs	195	212	167	191	255	296	437	493	503	558
Other Asia	80	6	-11	-9	3	49	62	66	86	52
Total East Asia	275	219	156	182	258	345	500	559	590	610
Total Developing	790	834	589	848	968	1,092	1,467	1,585	1,738	1,728
China	-1	-18	-22	-28	-31	-13	-24	-28	-21	-41
Soviet Union (former)	5	8	10	7	8	18	8	3	47	13
Eastern Europe	3	10	-64	-37	-4	-11	-6	-8	-10	-12
Total World	1,651	1,705	1,203	1,453	1,695	2,080	2,804	3,459	3,904	3,754

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports & Import for Consumption

TABLE 3.33

U.S. CHEMICAL TRADE WITH CANADA

(Millions of Dollars)

		1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
5 Chemicals & Rel. Prod.	Exports	2,576	100.0%	2,857	2,714	2,613	3,221	3,751	4,211	6,050	6,555	7,285	100.0%	11.1%
	Imports	2,393	100.0%	3,121	2,879	2,782	3,072	3,839	3,928	4,282	4,348	4,943	100.0%	13.7%
	Balance	183		-264	-165	-169	150	-87	283	1,768	2,207	2,342		
51 Organic Chemicals	Exports	605	23.5%	668	637	642	742	867	942	1,124	1,089	1,126	15.5%	3.4%
	Imports	534	22.3%	579	583	463	529	802	601	798	757	851	17.2%	12.4%
	Balance	71		88	54	179	212	65	340	325	331	274		
52 Inorganic Chemicals	Exports	297	11.5%	312	329	345	387	484	483	460	489	490	6.7%	0.2%
	Imports	686	28.7%	1,124	967	978	1,065	1,117	1,251	1,061	1,025	1,026	20.8%	0.1%
	Balance	-389		-812	-639	-633	-678	-633	-768	-602	-536	-537		
53 Dyeing & Coloring Mat.	Exports	164	6.4%	179	172	156	223	227	230	421	482	524	7.2%	8.7%
	Imports	51	2.1%	62	63	69	80	103	112	157	177	190	3.9%	7.5%
	Balance	113		117	109	87	143	124	118	265	305	334		
54 Pharmaceuticals	Exports	174	6.7%	174	181	185	212	255	266	450	552	757	10.4%	37.1%
	Imports	16	0.7%	21	26	24	32	44	71	99	118	171	3.5%	45.6%
	Balance	158		153	155	162	181	211	195	350	435	586		
55 Oils Perfumes & Cleansing	Exports	118	4.6%	116	103	105	140	165	215	401	521	633	8.7%	21.6%
	Imports	34	1.4%	41	66	81	79	95	132	166	185	232	4.7%	25.1%
	Balance	84		76	36	24	61	70	84	235	336	401		
56 Fertilizers	Exports	119	4.6%	200	171	106	110	115	245	188	197	196	2.7%	-0.6%
	Imports	735	30.7%	836	666	569	579	715	708	751	723	762	15.4%	5.5%
	Balance	-616		-635	-495	-463	-469	-600	-463	-563	-526	-567		
57 Primary Plastics	Exports	381	14.8%	394	374	387	552	625	704	1,175	1,267	1,422	19.5%	12.3%
	Imports	90	3.7%	143	184	228	280	445	495	610	607	761	15.4%	25.4%
	Balance	291		251	190	160	272	181	209	565	660	661		
58 Non-Primary Plastics	Exports	328	12.7%	350	304	291	395	445	433	735	756	853	11.7%	12.8%
	Imports	150	6.3%	197	196	226	262	347	356	403	452	536	10.8%	18.5%
	Balance	178		153	108	66	133	99	77	331	304	317		
59 Chemical Mat. & Prod. NES	Exports	392	15.2%	464	444	394	461	567	694	1,097	1,203	1,285	17.6%	6.8%
	Imports	99	4.1%	118	126	144	166	172	201	237	305	413	8.4%	35.6%
	Balance	293		346	318	250	295	395	492	860	898	872		

Source: U.S. Department of Commerce

Standard International Trade Code; Revision 3; Domestic Exports & Imports For Consumption

TABLE 3.34

U.S. CHEMICAL TRADE WITH MEXICO
(Millions of Dollars)

		1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
5 Chemicals & Rel. Prod.	Exports	1,055	100.0%	1,255	1,408	1,261	1,431	1,836	2,195	2,299	2,624	3,121	100.0%	18.9%
	Imports	279	100.0%	481	440	326	385	550	570	647	700	820	100.0%	17.2%
	Balance	776		774	968	936	1,047	1,286	1,625	1,653	1,925	2,301		
51 Organic Chemicals	Exports	420	39.9%	544	604	476	523	665	680	599	705	806	25.8%	14.3%
	Imports	31	10.9%	57	40	45	59	116	150	140	227	285	34.8%	25.4%
	Balance	390		487	564	431	464	549	531	458	478	521		
52 Inorganic Chemicals	Exports	114	10.8%	115	136	127	168	182	205	223	259	276	8.8%	6.5%
	Imports	166	59.4%	173	134	124	137	193	204	236	182	195	23.8%	7.2%
	Balance	-52		-57	2	2	31	-11	1	-13	77	80		
53 Dyeing & Coloring Mat.	Exports	38	3.6%	45	46	48	58	67	69	98	113	162	5.2%	43.2%
	Imports	6	2.0%	25	31	13	19	41	33	39	26	24	3.0%	-6.0%
	Balance	32		19	15	35	39	26	35	59	88	138		
54 Pharmaceuticals	Exports	30	2.8%	38	46	47	48	57	73	105	120	130	4.2%	7.9%
	Imports	11	4.0%	11	11	19	23	22	16	15	18	27	3.3%	51.5%
	Balance	19		27	35	28	25	35	58	90	102	102		
55 Oils Perfumes & Cleansing	Exports	18	1.7%	21	25	26	26	35	83	125	112	199	6.4%	77.3%
	Imports	17	6.0%	18	17	22	32	37	39	44	52	70	8.5%	33.1%
	Balance	1		3	8	4	-6	-2	44	81	60	130		
56 Fertilizers	Exports	51	4.9%	82	55	24	24	13	55	44	49	77	2.5%	56.7%
	Imports	8	2.8%	4	1	3	6	3	10	15	15	13	1.6%	-13.0%
	Balance	44		78	54	22	19	10	45	29	34	64		
57 Primary Plastics	Exports	230	21.8%	209	250	264	296	409	542	533	600	668	21.4%	11.2%
	Imports	21	7.4%	35	36	35	49	63	34	31	45	71	8.6%	56.6%
	Balance	210		174	215	230	247	346	508	502	555	597		
58 Non-Primary Plastics	Exports	71	6.8%	103	136	145	185	277	281	320	354	481	15.4%	36.1%
	Imports	15	5.3%	23	32	45	49	57	59	76	79	76	9.3%	-3.3%
	Balance	56		80	104	100	136	221	222	244	275	405		
59 Chemical Mat. & Prod. NES	Exports	83	7.8%	98	109	103	104	130	208	252	311	321	10.3%	3.3%
	Imports	6	2.2%	135	138	19	12	16	26	49	55	58	7.1%	6.6%
	Balance	76		-37	-29	84	92	113	181	203	256	263		

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports & Imports For Consumption

TABLE 3.35

U.S. CHEMICAL TRADE WITH JAPAN
(Millions of Dollars)

		1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
5 Chemicals & Rel. Prod.	Exports	2,603	100.0%	3,000	2,914	3,062	3,401	3,982	4,665	4,583	5,048	4,710	100.0%	-6.7%
	Imports	1,141	100.0%	1,390	1,511	1,894	2,264	2,364	2,367	2,387	2,739	3,218	100.0%	17.5%
	Balance	1,462		1,610	1,403	1,168	1,137	1,618	2,298	2,196	2,309	1,492		
51 Organic Chemicals	Exports	653	25.1%	704	690	743	900	1,120	1,176	1,126	1,178	992	21.1%	-15.8%
	Imports	394	34.5%	471	525	680	810	854	927	839	993	1,191	37.0%	19.9%
	Balance	260		233	165	63	90	266	249	286	185	-200		
52 Inorganic Chemicals	Exports	632	24.3%	834	820	909	872	936	1,130	963	1,130	1,092	23.2%	-3.3%
	Imports	106	9.3%	105	110	110	157	151	164	158	184	214	6.7%	16.3%
	Balance	526		729	710	799	715	786	966	805	946	878		
53 Dyeing & Coloring Mat.	Exports	51	2.0%	56	62	68	76	95	93	116	113	104	2.2%	-7.9%
	Imports	123	10.8%	179	195	271	340	259	154	169	219	240	7.5%	9.4%
	Balance	-72		-123	-133	-203	-263	-165	-61	-54	-107	-136		
54 Pharmaceuticals	Exports	504	19.4%	524	549	576	613	725	785	764	809	817	17.4%	1.0%
	Imports	111	9.8%	102	115	162	174	193	213	214	296	365	11.4%	23.2%
	Balance	393		422	434	414	439	531	573	550	512	452		
55 Oils Perfumes & Cleansing	Exports	58	2.2%	74	71	78	125	111	163	249	284	231	4.9%	-18.7%
	Imports	22	1.9%	29	33	44	56	73	65	64	67	66	2.0%	-1.4%
	Balance	35		45	38	35	69	38	98	185	217	165		
56 Fertilizers	Exports	103	4.0%	156	108	48	73	79	151	160	165	146	3.1%	-11.7%
	Imports	4	0.4%	5	5	3	3	4	10	7	7	6	0.2%	-13.3%
	Balance	99		151	103	45	70	76	141	153	158	139		
57 Primary Plastics	Exports	252	9.7%	276	223	234	294	397	443	447	517	458	9.7%	-11.4%
	Imports	141	12.4%	179	184	189	217	217	304	315	319	372	11.6%	16.6%
	Balance	111		97	39	45	77	179	140	132	197	85		
58 Non-Primary Plastics	Exports	96	3.7%	103	103	112	141	162	188	195	194	173	3.7%	-10.6%
	Imports	133	11.7%	178	199	242	273	323	336	370	373	416	12.9%	11.4%
	Balance	-37		-75	-96	-130	-132	-162	-148	-175	-179	-242		
59 Chemical Mat. & Prod. NES	Exports	254	9.8%	273	289	293	307	358	536	564	659	697	14.8%	5.7%
	Imports	107	9.4%	143	146	193	234	289	195	251	279	347	10.8%	24.4%
	Balance	147		130	143	101	73	69	341	313	380	350		

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports & Imports For Consumption

TABLE 3.36

U.S. CHEMICAL TRADE WITH TOTAL EC
(Millions of Dollars)

		1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
5 Chemicals & Rel. Prod.	Exports	5,060	100.0%	5,811	5,912	6,272	7,086	8,319	9,759	10,510	11,259	12,051	100.0%	7.0%
	Imports	4,531	100.0%	5,818	6,294	6,491	7,228	8,897	8,988	9,505	10,095	11,600	100.0%	14.9%
	Balance	529		-7	-382	-219	-141	-578	770	1,005	1,164	451		
51 Organic Chemicals	Exports	1,477	29.2%	1,630	1,746	1,774	2,204	2,620	3,037	3,039	3,297	3,461	28.7%	5.0%
	Imports	1,845	40.7%	2,313	2,466	2,414	2,775	3,645	3,539	3,474	3,627	4,008	34.6%	10.5%
	Balance	-368		-683	-720	-639	-571	-1,025	-502	-435	-330	-547		
52 Inorganic Chemicals	Exports	653	12.9%	984	1,030	995	989	906	939	757	795	869	7.2%	9.4%
	Imports	735	16.2%	979	1,126	1,040	894	1,111	964	1,021	1,070	1,085	9.4%	1.4%
	Balance	-82		5	-96	-45	94	-205	-25	-264	-275	-216		
53 Dyeing & Coloring Mat.	Exports	168	3.3%	155	143	183	224	278	261	402	368	426	3.5%	15.9%
	Imports	348	7.7%	425	442	552	637	679	612	653	716	803	6.9%	12.2%
	Balance	-180		-270	-300	-369	-412	-401	-351	-251	-348	-377		
54 Pharmaceuticals	Exports	816	16.1%	867	916	1,073	1,039	1,320	1,573	1,723	1,943	2,334	19.4%	20.1%
	Imports	493	10.9%	679	656	686	920	1,121	1,230	1,516	1,803	2,283	19.7%	26.6%
	Balance	323		188	259	387	119	199	343	208	140	51		
55 Oils Perfumes & Cleansing	Exports	183	3.6%	171	186	185	210	286	341	410	508	519	4.3%	2.3%
	Imports	249	5.5%	371	422	466	515	614	569	631	686	816	7.0%	19.1%
	Balance	-66		-200	-236	-281	-306	-327	-228	-221	-178	-297		
56 Fertilizers	Exports	232	4.6%	310	222	133	214	154	357	270	231	140	1.2%	-39.6%
	Imports	72	1.6%	77	91	76	60	91	70	68	62	56	0.5%	-9.8%
	Balance	160		233	131	57	154	62	287	202	169	84		
57 Primary Plastics	Exports	588	11.6%	689	691	763	861	1,125	1,397	1,603	1,708	1,654	13.7%	-3.1%
	Imports	215	4.8%	292	342	407	426	473	639	681	690	799	6.9%	15.9%
	Balance	372		397	349	356	436	653	759	922	1,018	855		
58 Non-Primary Plastics	Exports	307	6.1%	358	338	403	446	519	616	700	683	724	6.0%	6.0%
	Imports	256	5.7%	290	305	337	373	424	444	478	481	518	4.5%	7.7%
	Balance	50		68	34	66	73	96	172	222	202	206		
59 Chemical Mat. & Prod. NES	Exports	637	12.6%	646	641	763	899	1,110	1,239	1,607	1,727	1,924	16.0%	11.4%
	Imports	317	7.0%	391	444	513	628	740	921	982	961	1,232	10.6%	28.2%
	Balance	319		255	196	250	272	370	318	624	767	692		

Source: U.S. Department of Commerce
Standard International Trade Code; Revision 3; Domestic Exports & Imports For Consumption

TABLE 3.37

U.S. CHEMICAL TRADE WITH TOTAL WESTERN EUROPE

(Millions of Dollars)

		1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
5 Chemicals & Rel. Prod.	Exports	5,977	100.0%	6,643	6,801	7,022	7,907	9,235	10,916	11,648	12,323	13,088	100.0%	6.2%
	Imports	5,077	100.0%	6,495	7,197	7,410	8,295	10,245	10,400	11,137	11,943	13,737	100.0%	15.0%
	Balance	900		149	-397	-388	-387	-1,011	516	511	380	-648		
51 Organic Chemicals	Exports	1,726	28.9%	1,905	2,005	1,970	2,474	2,929	3,513	3,386	3,645	3,784	28.9%	3.8%
	Imports	2,062	40.6%	2,577	2,769	2,718	3,180	4,209	4,042	4,011	4,285	4,728	34.4%	10.4%
	Balance	-336		-672	-765	-748	-706	-1,280	-529	-625	-640	-944		
52 Inorganic Chemicals	Exports	932	15.6%	1,160	1,278	1,120	1,069	998	995	833	842	919	7.0%	9.2%
	Imports	791	15.6%	1,047	1,250	1,118	965	1,204	1,058	1,109	1,162	1,184	8.6%	1.9%
	Balance	141		113	28	2	104	-205	-63	-276	-320	-265		
53 Dyeing & Coloring Mat.	Exports	188	3.1%	176	164	212	253	313	298	450	406	465	3.6%	14.3%
	Imports	407	8.0%	489	506	651	751	795	725	780	834	955	7.0%	14.5%
	Balance	-219		-313	-343	-438	-498	-482	-426	-330	-427	-490		
54 Pharmaceuticals	Exports	982	16.4%	1,010	1,077	1,274	1,240	1,529	1,806	1,982	2,203	2,622	20.0%	19.0%
	Imports	591	11.7%	809	886	930	1,185	1,460	1,672	2,085	2,459	3,101	22.6%	26.1%
	Balance	391		201	190	344	54	69	134	-104	-256	-479		
55 Oils Perfumes & Cleansing	Exports	198	3.3%	187	205	203	233	317	379	457	557	565	4.3%	1.4%
	Imports	274	5.4%	409	460	522	572	683	632	706	757	902	6.6%	19.2%
	Balance	-76		-221	-254	-320	-339	-367	-253	-249	-199	-337		
56 Fertilizers	Exports	267	4.5%	374	280	168	262	187	430	358	290	155	1.2%	-46.5%
	Imports	81	1.6%	88	104	85	74	108	96	88	90	78	0.6%	-12.7%
	Balance	186		286	176	84	188	79	334	270	200	77		
57 Primary Plastics	Exports	628	10.5%	718	725	800	907	1,183	1,466	1,692	1,805	1,744	13.3%	-3.4%
	Imports	229	4.5%	313	367	436	457	509	696	754	763	883	6.4%	15.8%
	Balance	399		405	358	364	450	674	770	938	1,042	860		
58 Non-Primary Plastics	Exports	338	5.7%	395	370	441	488	567	673	757	728	769	5.9%	5.7%
	Imports	281	5.5%	325	338	377	415	470	496	539	530	574	4.2%	7.1%
	Balance	57		69	32	64	72	96	177	218	192	195		
59 Chemical Mat. & Prod. NES	Exports	717	12.0%	719	697	833	982	1,212	1,356	1,733	1,847	2,065	15.8%	11.8%
	Imports	360	7.1%	437	517	574	695	807	982	1,065	1,059	1,331	9.7%	25.7%
	Balance	357		282	181	259	287	405	373	668	788	734		

Source: U.S. Department of Commerce

Standard International Trade Code; Revision 3; Domestic Exports & Imports For Consumption

TABLE 3.38

U.S. CHEMICAL TRADE WITH ASIAN NICS
(Millions of Dollars)

		1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
5 Chemicals & Rel. Prod.	Exports	1,771	100.0%	1,979	1,737	2,273	3,032	4,199	4,733	4,656	5,173	5,135	100.0%	-0.7%
	Imports	258	100.0%	336	414	566	631	717	740	1,022	1,166	1,275	100.0%	9.3%
	Balance	1,513		1,643	1,323	1,707	2,401	3,482	3,993	3,634	4,006	3,860		
51 Organic Chemicals	Exports	672	37.9%	716	717	1,012	1,348	1,960	2,149	1,884	1,981	1,832	35.7%	-7.5%
	Imports	54	20.9%	70	136	211	232	268	271	430	544	655	51.4%	20.5%
	Balance	618		646	581	801	1,116	1,692	1,878	1,454	1,437	1,177		
52 Inorganic Chemicals	Exports	240	13.5%	246	217	253	250	304	442	375	343	436	8.5%	27.2%
	Imports	11	4.1%	14	12	15	14	20	23	20	20	15	1.2%	-23.5%
	Balance	229		232	205	238	236	285	419	355	323	421		
53 Dyeing & Coloring Mat.	Exports	64	3.6%	68	63	89	121	141	144	203	213	228	4.5%	7.0%
	Imports	6	2.5%	10	9	12	16	21	30	51	57	58	4.6%	2.6%
	Balance	58		58	54	77	105	120	114	152	157	170		
54 Pharmaceuticals	Exports	69	3.9%	78	84	90	105	137	140	171	186	198	3.9%	6.5%
	Imports	3	1.0%	10	6	7	10	16	9	24	39	35	2.7%	-10.3%
	Balance	66		69	78	83	95	121	131	147	147	163		
55 Oils Perfumes & Cleansing	Exports	64	3.6%	78	69	86	93	118	157	197	276	302	5.9%	9.4%
	Imports	7	2.8%	12	22	43	48	47	50	47	62	86	6.7%	38.3%
	Balance	57		67	47	42	46	71	107	151	214	217		
56 Fertilizers	Exports	76	4.3%	176	93	32	37	38	71	90	80	93	1.8%	16.0%
	Imports	0	0.0%	0	0	0	0	0	0	1	0	0	0.0%	56.8%
	Balance	76		176	93	32	37	38	71	89	80	92		
57 Primary Plastics	Exports	333	18.8%	332	256	428	698	1,025	983	1,022	1,335	1,189	23.2%	-10.9%
	Imports	26	10.1%	31	39	56	58	52	64	158	125	90	7.1%	-27.8%
	Balance	307		301	217	372	640	974	919	864	1,210	1,099		
58 Non-Primary Plastics	Exports	48	2.7%	55	52	67	98	154	191	200	230	267	5.2%	16.1%
	Imports	140	54.4%	173	171	196	227	268	275	269	294	304	23.9%	3.3%
	Balance	-93		-118	-120	-129	-129	-113	-84	-69	-65	-38		
59 Chemical Mat. & Prod. NES	Exports	206	11.6%	229	187	216	282	322	455	515	529	590	11.5%	11.5%
	Imports	11	4.3%	17	20	25	27	26	18	22	26	32	2.5%	22.6%
	Balance	195		212	167	191	255	296	437	493	503	558		

Source: U.S. Department of Commerce
Standard International Trade Code, Revision 3; Domestic Exports & Imports For Consumption

TABLE 3.39

U.S. CHEMICAL TRADE WITH CHINA
(Millions of Dollars)

		1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
5 Chemicals & Rel. Prod.	Exports	353	100.0%	645	507	422	748	1,308	1,136	1,054	1,671	1,208	100.0%	-27.7%
	Imports	129	100.0%	149	154	170	193	225	271	335	387	501	100.0%	29.5%
	Balance	224		495	353	252	556	1,082	864	718	1,284	707		
51 Organic Chemicals	Exports	33	9.4%	98	89	81	153	280	286	245	270	206	17.0%	-23.8%
	Imports	34	26.3%	41	31	40	42	49	60	70	84	116	23.2%	38.9%
	Balance	-1		57	58	40	112	231	227	175	186	89		
52 Inorganic Chemicals	Exports	20	5.6%	19	18	66	155	188	82	21	31	32	2.6%	0.9%
	Imports	16	12.3%	31	36	31	38	51	57	98	89	116	23.1%	30.3%
	Balance	4		-11	-18	34	117	137	26	-77	-58	-84		
53 Dyeing & Coloring Mat.	Exports	1	0.2%	2	5	5	5	10	14	22	22	43	3.6%	100.4%
	Imports	3	2.3%	2	4	6	8	13	14	22	26	34	6.8%	30.8%
	Balance	-2		0	1	-1	-2	-3	0	0	-4	9		
54 Pharmaceuticals	Exports	1	0.4%	1	2	3	18	6	8	14	15	23	1.9%	52.2%
	Imports	21	16.1%	17	21	21	24	26	49	47	79	99	19.8%	25.5%
	Balance	-19		-16	-19	-18	-7	-19	-41	-33	-64	-76		
55 Oils Perfumes & Cleansing	Exports	0	0.1%	1	1	2	3	5	7	12	14	12	1.0%	-9.8%
	Imports	15	11.5%	15	15	16	16	24	20	23	27	33	6.6%	24.2%
	Balance	-15		-14	-13	-13	-13	-20	-13	-11	-13	-21		
56 Fertilizers	Exports	168	47.6%	267	139	46	130	182	487	544	982	629	52.1%	-35.9%
	Imports	0	0.0%	0	0	0	1	0	2	0	0	0	0.0%	-17.0%
	Balance	168		267	139	46	129	182	486	544	982	629		
57 Primary Plastics	Exports	92	26.1%	234	226	191	239	575	197	151	268	199	16.5%	-25.7%
	Imports	2	1.8%	5	2	3	3	8	9	12	9	10	2.1%	15.6%
	Balance	90		229	225	188	236	567	188	140	259	189		
58 Non-Primary Plastics	Exports	1	0.2%	2	3	4	16	21	16	11	20	18	1.5%	-8.2%
	Imports	0	0.1%	0	0	1	1	1	1	1	3	5	1.0%	68.8%
	Balance	1		2	3	3	14	20	16	10	17	13		
59 Chemical Mat. & Prod. NES	Exports	37	10.6%	20	23	24	29	40	37	33	50	46	3.8%	-7.9%
	Imports	38	29.7%	39	45	52	60	53	61	62	71	87	17.4%	23.4%
	Balance	-1		-18	-22	-28	-31	-13	-24	-28	-21	-41		

Source: U.S. Department of Commerce
Standard International Trade Code, Revision 3, Domestic Exports & Imports For Consumption

TABLE 3.40

U.S. CHEMICAL TRADE WITH EASTERN EUROPE

(Millions of Dollars)

		1983	Share % 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Share % 1992	1992/1991 % Change
5 Chemicals & Rel. Prod.	Exports	67	100.0%	101	90	94	65	59	77	58	62	83	100.0%	33.7%
	Imports	53	100.0%	117	182	162	70	102	99	80	79	86	100.0%	8.9%
	Balance	14		-16	-92	-67	-5	-43	-22	-22	-17	-3		
51 Organic Chemicals	Exports	7	9.8%	9	12	15	11	13	15	12	5	10	12.4%	90.7%
	Imports	11	19.9%	21	33	33	25	25	15	12	13	16	18.5%	25.4%
	Balance	-4		-12	-21	-18	-15	-12	0	0	-7	-6		
52 Inorganic Chemicals	Exports	12	18.3%	7	15	25	17	15	7	12	6	4	4.8%	-37.6%
	Imports	5	9.3%	4	3	6	6	10	4	6	7	5	6.2%	-20.4%
	Balance	7		3	11	19	11	5	4	6	0	-1		
53 Dyeing & Coloring Mat.	Exports	2	3.4%	1	2	2	1	2	1	1	1	3	3.9%	143.5%
	Imports	2	3.0%	2	9	5	2	8	4	4	9	14	16.6%	55.9%
	Balance	1		0	-7	-3	-1	-6	-4	-3	-8	-11		
54 Pharmaceuticals	Exports	5	7.9%	6	8	7	6	5	8	6	13	24	28.5%	78.1%
	Imports	5	9.8%	5	6	8	7	7	10	13	15	15	17.4%	2.4%
	Balance	0		1	2	-1	-1	-2	-2	-6	-1	9		
55 Oils Perfumes & Cleansing	Exports	2	2.9%	2	2	3	1	1	2	4	16	24	28.9%	45.6%
	Imports	1	2.1%	2	1	1	1	1	1	1	2	4	4.2%	58.0%
	Balance	1		1	1	2	0	0	1	2	14	20		
56 Fertilizers	Exports	29	43.5%	58	36	23	20	10	31	12	2	1	1.4%	-51.5%
	Imports	24	45.3%	75	50	61	17	29	52	22	12	6	7.1%	-48.8%
	Balance	5		-17	-14	-38	3	-19	-21	-10	-9	-5		
57 Primary Plastics	Exports	1	1.8%	1	2	1	2	4	8	2	4	2	2.8%	-39.2%
	Imports	1	1.2%	3	4	2	1	3	1	5	3	3	3.8%	23.3%
	Balance	1		-2	-3	-1	1	1	7	-3	1	-1		
58 Non-Primary Plastics	Exports	2	2.4%	2	2	10	1	2	1	2	5	5	5.9%	-9.5%
	Imports	1	1.6%	1	1	1	1	1	1	1	1	1	0.8%	-49.1%
	Balance	1		1	2	10	0	1	0	1	4	4		
59 Chemical Mat. & Prod. NES	Exports	7	10.1%	14	10	9	6	8	5	7	8	9	11.4%	24.3%
	Imports	4	7.9%	4	74	45	10	18	11	15	18	22	25.4%	24.3%
	Balance	3		10	-64	-37	-4	-11	-6	-8	-10	-12		

Source: U.S. Department of Commerce

Standard International Trade Code; Revision 3; Domestic Exports & Imports For Consumption.

TABLE 3.41

U.S. CHEMICALS TRADE: VOLUME -- PRICES -- TERMS OF TRADE *

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annualized Rates of Change: 1992/87	1992/91
In Millions of Current Dollars:												
Exports	19,969	22,833	21,831	22,524	26,026	31,911	36,489	38,989	42,974	43,964	11.1%	2.3%
Imports	10,869	13,820	14,590	15,129	16,369	19,911	20,519	22,173	23,808	27,214	10.7%	14.3%
Balance	9,100	9,013	7,241	7,395	9,657	12,000	15,970	16,815	19,166	16,750	11.6%	-12.6%
In Millions of 1985 Dollars:												
Exports	19,831	22,386	21,831	23,173	24,392	26,050	30,382	32,902	36,388	38,296	9.4%	5.2%
Imports	10,532	13,378	14,590	15,175	15,471	16,874	17,071	18,478	19,644	22,215	7.5%	13.1%
Balance	9,298	9,007	7,241	7,999	8,920	9,176	13,312	14,424	16,744	16,080	12.5%	-4.0%
Price Indexes (1985=100)												
Exports:												
5 Chemicals & Related Products	100.7	102.0	100.0	97.2	106.7	122.5	120.1	118.5	118.1	114.8	1.5%	-2.8%
51 Organic Chemicals	n/a	104.0	100.0	96.9	115.0	146.0	139.1	125.0	117.3	113.8	-0.2%	-3.0%
55 Essential Oils and Perfume Materials	n/a	n/a	100.0	104.0	106.7	116.9	123.8	126.6	128.2	130.3	4.1%	1.6%
56 Fertilizers, Manufactured	103.7	109.8	100.0	88.6	96.2	114.2	107.8	104.9	108.5	93.0	-0.7%	-14.3%
59 Chemical Materials & Products	n/a	97.6	100.0	99.4	97.6	102.9	109.4	115.2	118.9	119.9	4.2%	0.8%
Imports:												
5 Chemicals & Related Products	103.2	103.3	100.0	99.7	105.8	118.0	120.2	120.0	121.2	122.5	3.0%	1.1%
51 Organic Chemicals	n/a	n/a	100.0	91.0	99.3	109.9	113.7	116.1	113.8	111.2	2.3%	-2.3%
52 Inorganic Chemicals	n/a	108.8	100.0	96.0	90.1	93.4	87.9	86.0	87.3	84.6	-1.3%	-3.1%
54 Medicinal and Pharmaceutical Products	n/a	100.3	100.0	112.6	123.5	141.9	151.8	154.3	158.1	167.8	6.3%	6.1%
55 Essential Oils and Perfume Materials	n/a	98.5	100.0	105.4	119.4	127.5	130.8	133.8	137.0	142.8	3.6%	4.2%
56 Fertilizers, Manufactured	n/a	113.0	100.0	91.0	107.6	136.6	137.1	132.1	141.9	136.7	4.9%	-3.7%
59 Chemical Materials & Products	n/a	n/a	100.0	110.7	119.6	131.0	135.7	143.7	137.6	151.2	4.8%	9.9%
Terms of Trade (Export Prices/Import Prices)												
5 Chemicals & Related Products	97.6	98.7	100.0	97.5	100.9	103.8	99.9	98.8	97.4	93.7	-1.5%	-3.8%
51 Organic Chemicals	n/a	n/a	100.0	106.5	115.8	132.8	122.3	107.7	103.1	102.3	-2.4%	-0.7%
55 Essential Oils and Perfume Materials	n/a	n/a	100.0	98.7	89.4	91.7	94.6	94.6	93.6	91.2	0.4%	-2.5%
56 Fertilizers, Manufactured	n/a	97.2	100.0	97.4	89.4	83.6	78.6	79.4	76.5	68.0	-5.3%	-11.0%
59 Chemical Materials & Products	n/a	n/a	100.0	89.8	81.6	78.5	80.6	80.2	86.4	79.3	-0.6%	-8.2%

Source: U.S. Department of Commerce, Bureau of Labor Statistics

* Data series begin at differing years for the sub-components.

Terms of trade can be seen as a measure of the international price competitiveness of the chemical industry or its segments: When the ratio rises, the industry's own products have increased in price relative to those of its international competitors, so the industry's competitive position in price terms has deteriorated. Conversely, a fall in the ratio's value reflects a strengthening of the industry's price-competitiveness.

TABLE 3.42

U.S. COMPANIES' SALES AND EXPORTS IN 1987 (*1)

	Number of Companies	(Share)	Total Sales (Billion $)	(Share)	Number of Exporters	(Share)	Share of Companies that Export	Total Exports (Billion $)	(Share)
All Manufacturers & Intermediaries:(*2)	1,578,341	100.0%	5,676	100.0%	104,564	100.0%	6.6%	241.3	100.0%
Very Small Firms (1-19 employees)	1,327,735	84.1%	913	16.1%	65,627	62.8%	4.9%	29.9	12.4%
Small Firms (20-99)	213,624	13.5%	1,026	18.1%	25,432	24.3%	11.9%	18.2	7.6%
Medium-Sized Firms (100-499)	31,101	2.0%	773	13.6%	9,745	9.3%	31.3%	21.2	8.8%
Large Firms (500+)	5,881	0.4%	2,964	52.2%	3,760	3.6%	63.9%	172.0	71.3%
Manufacturers: (SICs 20-39)	289,881	100.0%	2,645	100.0%	37,287	100.0%	12.9%	155.6	100.0%
Very Small	206,243	71.1%	104	3.9%	12,975	34.8%	6.3%	2.4	1.5%
Small	64,695	22.3%	234	8.8%	14,234	38.2%	22.0%	4.6	2.9%
Medium	15,247	5.3%	305	11.5%	7,217	19.4%	47.3%	11.2	7.2%
Large	3,696	1.3%	2,002	75.7%	2,861	7.7%	77.4%	137.5	88.3%
Chemical Companies: (SIC 28)	**7,335**	**100.0%**	**213.0**	**100.0%**	**2,168**	**100.0%**	**29.6%**	**17.89**	**100.0%**
Very Small	**4,965**	**67.7%**	**5.9**	**2.8%**	**899**	**41.5%**	**18.1%**	**0.36**	**2.0%**
Small	**1,700**	**23.2%**	**11.5**	**5.4%**	**750**	**34.6%**	**44.1%**	**0.32**	**1.8%**
Medium	**474**	**6.5%**	**18.3**	**8.6%**	**332**	**15.3%**	**70.0%**	**0.71**	**4.0%**
Large	**196**	**2.7%**	**177.3**	**83.3%**	**187**	**8.6%**	**95.4%**	**16.50**	**92.2%**
Intermediaries: (*3)	1,288,460	100.0%	3,031	100.0%	67,277	100.0%	5.2%	85.7	100.0%
Very Small	1,121,492	87.0%	809	26.7%	52,652	78.3%	4.7%	27.5	32.1%
Small	148,929	11.6%	792	26.1%	11,198	16.6%	7.5%	13.7	16.0%
Medium	15,854	1.2%	467	15.4%	2,528	3.8%	15.9%	10.0	11.7%
Large	2,185	0.2%	962	31.7%	899	1.3%	41.1%	34.5	40.3%

(*1) 1987 is the latest year available. Exports are FOB-plant (merchandise values at the location from which the product is shipped). Figures only include firms with paid employment. (The 153,168 manufacturers and intermediaries with no paid employees in 1987 accounted for only 0.54% of the sectors' total sales.)

(*2) The category "All Manufacturers and Intermediaries" includes all significant exporters of merchandise.

(*3) Intermediaries are firms that sell products made by other firms: mainly wholesalers and retailers.

Source: U.S. Department of Commerce (preliminary data from the Exporter Database)

TABLE 3.43

U.S. COMPANY CONCENTRATION IN SALES AND EXPORTS: SELECTED INDUSTRIES, 1987

	Top 50 Firms' Shares:		Top 50 Exporters' Shares:	
	of Total Sales*	of the Total Number of Firms	of Total Exports	of the Total Number of Exporters
Manufacturing Sector:	25.98%	0.017%	50.02%	0.13%
Chemical Products	**63.42%**	**0.682%**	**83.53%**	**2.31%**
Tobacco Products	99.96%	54.348%	100.00%	100.00%
Apparel	27.85%	0.238%	59.51%	3.75%
Special Trade Contractors *(in the construction sector)*	3.98%	0.015%	n/a	n/a

* Domestic sales only.

Source: U.S. Department of Commerce (preliminary data from the Exporter Database)

Section 4
Investment In Research and Development

The U.S. chemical industry has consistently been one of the largest U.S. private-sector investors in research and development (R&D). New products and processes are the driving force of the continued international competitiveness of the U.S. chemical industry. Over 80,000 chemists, other scientists, engineers, and technicians are engaged constantly in developing new and better process technologies, new chemical compounds and products, and new applications for existing chemical products.

Prior to World War I, only three patents out of every 100 issued by the U.S. Patent Office were in the field of chemicals. In the 1980s, chemical patents accounted for about 15 percent of each year's total. This high level of research is benefiting the industry, and society as a whole. The payoff is a rapid rate of technological innovation, evidenced by a constant stream of new products and production processes.

There are two broad categories of research: basic and applied. Basic (or fundamental) research can be defined as any planned search for unknown facts and principles of general validity, without regard to commercial objectives. Applied research, on the other hand, can be defined as any investigation planned with the intent of using known phenomena or substances to accomplish a particular objective. In general, the basic research of today is the foundation for tomorrow's applied research.

Organized industrial research in the chemical industry did not begin until about 1900. Problems that arose during World War I gave new emphasis to research and marked the start of sizable programs. Since then, the industry's R&D effort has continued to expand, with spending reaching $13.1 billion in 1991. Today, most chemical companies allocate 4 to 6 percent of their annual sales for R&D. Moreover, unlike many other manufacturing industries, the U.S. chemical industry pays for most of its R&D. Government funding of chemical research is minimal: only about 0.7 percent of the industry total, compared with 24 percent of total manufacturing R&D.

Most successful research in the chemical industry is accomplished only after intensive effort and major expenditures. Typically, it takes four to eight years from the time a project is conceived to the time a chemical product is brought to the marketplace. For each project that successfully leads to a practical application, many are undertaken that are unsuccessful. For each success in the marketplace, there may be as many as one hundred failures. The successes must yield enough in profits to provide an adequate return on the total investment in R&D, including the many projects that prove unsuccessful.

Spurred by international competition, chemical industry research and development spending steadily expanded, resulting in a larger number of patents granted:

Chart 4.1

U.S. Chemical Industry: R&D Funding

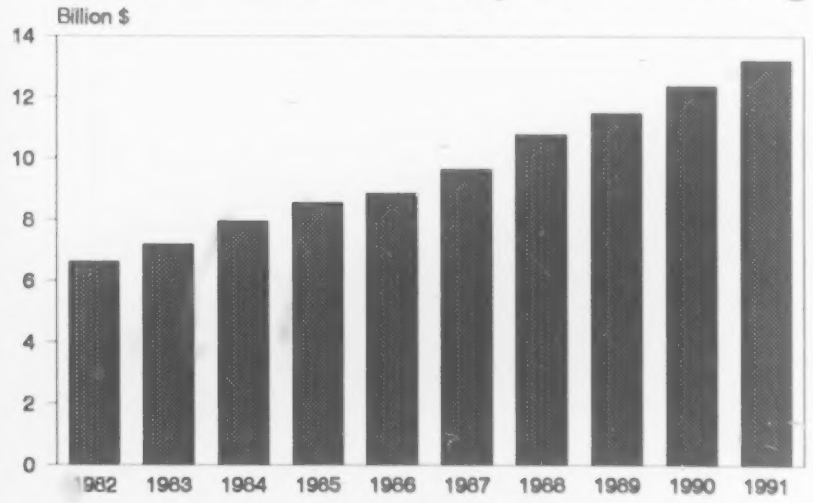
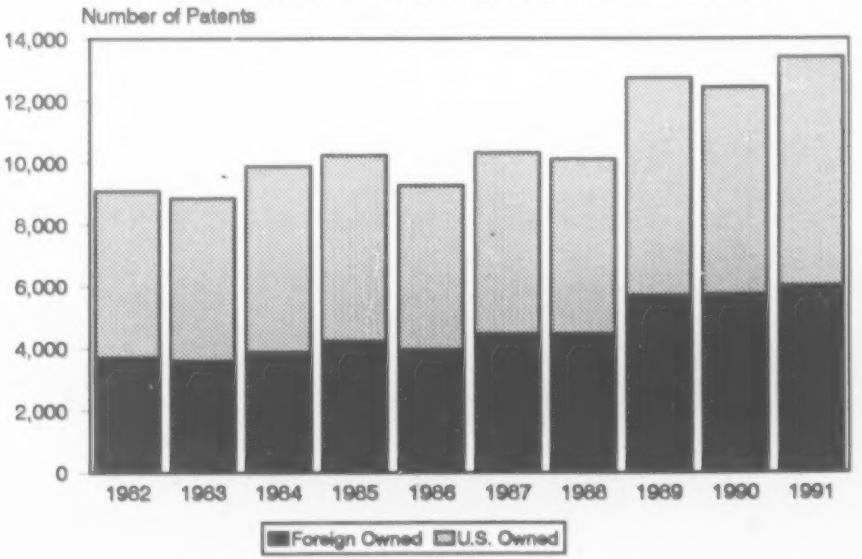


Chart 4.2

U.S. Chemical Patents Granted



The chemical industry spent 3.1 times as much on R&D in 1991 as it did in 1980. The chemical industry employs about 14% of all scientists and engineers in the manufacturing sector.

TABLE 4.1

RESEARCH & DEVELOPMENT FUNDING
(Millions of Dollars)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1980/70	1990/80	1991/90
Total R&D	26,134	62,583	80,001	89,126	101,116	113,745	119,863	127,316	135,231	142,000	150,000	154,500	n/a	9.1%	9.1%	3.0%
Manufacturing	17,362	42,689	56,178	61,931	69,895	77,525	80,377	84,311	89,776	93,568	95,332	92,604	n/a	9.4%	8.4%	-2.9%
Company Funds	10,063	29,439	38,633	42,504	48,152	52,642	55,192	56,259	60,412	64,942	67,392	70,111	n/a	11.3%	8.6%	4.0%
Federal Contracts	7,299	13,250	17,545	19,427	21,743	24,883	25,185	28,052	29,364	28,626	27,940	22,493	n/a	6.1%	7.7%	-19.5%
Chemicals & Allied Products	1,773	4,636	6,604	7,185	7,927	8,540	8,843	9,635	10,772	11,466	12,344	13,183	n/a	10.1%	10.3%	6.8%
Company Funds	1,593	4,264	6,197	6,792	7,736	8,310	8,664	9,445	10,573	11,383	12,277	13,094	n/a	10.3%	11.2%	6.7%
Federal Contracts	180	372	407	393	191	230	179	190	199	83	67	89	n/a	7.5%	-15.8%	32.8%

Source: National Science Foundation
1991 data are CMA estimates based on NSF data

TABLE 4.2

RESEARCH & DEVELOPMENT FUNDING AS A SHARE OF SALES

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Manufacturing	n/a	3.0%	3.8%	3.9%	3.9%	4.4%	4.7%	4.6%	4.7%	4.6%	4.7%	4.7%	n/a
Chemicals & Allied Products	n/a	3.6%	4.3%	4.4%	4.7%	5.0%	5.2%	5.3%	5.4%	5.4%	5.6%	5.7%	n/a

Source: National Science Foundation
1991 data are CMA estimates based on NSF and Census Bureau data

TABLE 4.3

R&D SCIENTISTS AND ENGINEERS
(Thousands, full-time equivalent)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates 1992/82	1992/87	1992/91
Manufacturing	n/a	449.4	498.3	531.3	553.5	580.0	609.1	605.8	612.5	622.5	618.0	595.4	578.5	1.5%	0.9%	-2.8%
Chemicals & Allied Products	40.1	51.4	61.6	67.3	69.8	71.1	75.8	75.2	75.8	77.6	78.9	78.8	82.2	2.9%	1.8%	4.3%
Industrial Chemicals	21.5	20.9	25.9	26.6	25.6	23.5	24.9	22.4	22.5	23.1	23.0	22.7	21.4	-1.9%	-0.9%	-5.7%
Drugs and Medicines	11.8	21.6	25.6	28.2	30.8	30.8	31.8	32.6	33.0	34.0	33.5	34.2	36.5	3.7%	2.5%	7.9%
Other Chemicals	6.8	8.9	10.1	12.1	13.4	16.7	19.1	20.2	20.3	20.5	22.4	21.9	23.9	9.0%	3.4%	9.1%

Source: National Science Foundation
1992 data are CMA estimates based on NSF data

TABLE 4.4

U.S. PATENTS GRANTED
(Number)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Manufacturing	64,305	61,810	57,881	56,855	67,189	71,649	70,790	82,863	77,809	95,321	90,158	96,047	n/a
Total by Nation of Origin:													
United States	46,982	37,351	33,891	32,867	38,354	39,550	38,088	43,465	40,415	50,063	47,283	50,895	n/a
Japan	2,618	7,124	8,149	8,792	11,109	12,743	13,198	16,538	16,140	20,116	19,477	20,916	n/a
West Germany	4,429	5,780	5,467	5,477	6,322	6,717	6,850	7,881	7,349	8,341	7,590	7,657	n/a
United Kingdom	2,949	2,406	2,134	1,931	2,271	2,495	2,408	2,777	2,581	3,093	2,783	2,795	n/a
France	1,730	2,088	1,975	1,895	2,162	2,399	2,366	2,868	2,658	3,136	2,860	3,023	n/a
Switzerland	1,108	1,265	1,147	1,017	1,174	1,233	1,209	1,373	1,245	1,361	1,284	1,333	n/a
Other Nations	4,489	5,796	5,118	4,876	5,797	6,512	6,671	7,961	7,421	9,211	8,881	9,428	n/a
Chemicals & Allied Products	8,803	9,828	9,084	8,852	9,873	10,241	9,260	10,300	10,096	12,720	12,417	13,390	n/a
Total by Nation of Origin:													
United States	5,843	5,461	4,932	4,888	5,506	5,511	4,902	5,379	5,174	6,405	6,095	6,798	n/a
West Germany	826	1,167	1,114	1,078	1,140	1,180	1,154	1,255	1,281	1,577	1,551	1,512	n/a
Japan	528	1,102	1,193	1,195	1,321	1,563	1,419	1,601	1,630	2,067	2,232	2,339	n/a
United Kingdom	369	518	422	380	479	466	392	431	477	566	563	603	n/a
France	278	393	381	349	366	433	371	428	407	530	535	588	n/a
Switzerland	348	349	319	288	295	291	253	276	283	331	330	317	n/a
Other Nations	611	838	723	674	766	797	769	930	844	1,244	1,111	1,233	n/a
Total by Industry:													
Industrial Inorganic Chemicals	893	1,104	1,020	1,113	1,183	1,191	1,052	1,165	1,034	1,259	1,159	1,191	n/a
Plastic Materials and Synthetics	1,146	966	924	1,073	1,053	1,155	964	1,118	1,114	1,374	1,493	1,623	n/a
Drugs	498	1,373	1,270	1,113	1,402	1,408	1,432	1,752	1,753	2,373	2,232	2,422	n/a
Soaps, Cleaners, and Toilet Goods	244	378	343	378	443	457	393	449	486	674	558	661	n/a
Paints and Allied Products	388	457	407	432	459	473	363	415	402	462	398	550	n/a
Industrial Organic Chemicals	4,671	3,893	3,495	3,093	3,453	3,546	3,253	3,396	3,282	4,038	4,154	4,296	n/a
Agricultural Chemicals	399	1,131	1,055	1,008	1,184	1,260	1,235	1,367	1,386	1,890	1,767	1,794	n/a
Miscellaneous Chemical Products	565	528	570	642	696	752	570	639	640	650	657	854	n/a
Total by Type of Ownership:													
US:	n/a	5,989	5,364	5,255	5,983	6,000	5,301	5,838	5,628	7,020	6,692	7,376	n/a
Corporate	n/a	4,935	4,481	4,385	5,016	5,069	4,457	4,852	4,715	5,773	5,431	6,088	n/a
Government	n/a	170	149	169	171	139	118	138	109	139	158	162	n/a
Individual	n/a	329	255	283	288	275	282	329	285	421	421	434	n/a
Unknown *	n/a	555	479	418	508	517	444	519	519	687	682	692	n/a
Foreign:	n/a	3,843	3,721	3,599	3,891	4,242	3,961	4,465	4,469	5,700	5,726	6,014	n/a
Corporate	n/a	3,555	3,401	3,322	3,600	3,985	3,676	4,146	4,148	5,283	5,314	5,555	n/a
Government	n/a	43	73	57	82	72	73	87	80	89	84	97	n/a
Individual	n/a	215	199	168	178	157	166	171	176	256	243	247	n/a
Unknown *	n/a	30	48	52	31	28	46	61	65	72	85	115	n/a

* Unknown: Not broken down by type of ownership. Under "US," it consists entirely of US-owned patents whose original applicants were residents of other countries; under "Foreign," this category covers all foreign-owned patents of US origin. Source: Patent and Trademark Office (All figures are for "fractional counts," so patents falling in more than one industry-category are counted only once.)

Section 5
Investment In Plant and Equipment

The nature of chemical production, which lends itself to a high degree of automation, engenders prodigious capital requirements. These high capital costs reflect the large plant capacity often needed to obtain economies of scale in producing chemicals, the intricate nature of the equipment and processes used, the large amounts of equipment needed, the high level of technology required, and the rapid technological obsolescence and depreciation of process plants. Indeed, the amount of gross capital stocks per employee in the chemical industry - $197,800 in 1992 - was over twice that for U.S. manufacturing as a whole.

New capital needs include not only extensive investment for new capacity but also for continual upgrading and replacement of existing plants to remain competitive and to protect the environment. Complete modernization programs that utilize the latest process technologies, often for "debottlenecking" (i.e., maximizing throughput in an existing plant) are frequently necessary. A long lead time is required for funding, designing, and completing chemical-industry capital spending programs. This makes short-run adjustments difficult as capital spending cannot easily be turned on and off. Given its capital-intensive nature, however, the industry is highly sensitive to the costs of capital.

Most of the investment data in this section is on an "establishment" (or "industry") basis: These are figures for total investment in chemical establishments (chemical factories) in the United States. Since most establishments are devoted to the production of a limited range of products, aggregate data regarding chemical establishments should, for the most part, apply only to chemical assets.

The tables in this section for new plant & equipment expenditures, however, are reported on a "company" basis: They consist of figures for total investment by chemical companies in the United States. Since companies are classified according to the industry segment that makes up the largest share of their total business, all of a company's capital spending will be attributed to that one industry, even if that segment only accounts, for example, for 20 percent of its revenues. Data tabulated on a company basis therefore includes investments in non-chemical establishments by chemical companies, but excludes investments in chemical establishments by non-chemical firms. For this reason, aggregate investment data on an establishment basis provides a more accurate view of investment in the U.S. chemical industry than does the company-based data.

Chemical industry expenditures for new plant & equipment have grown steadily in recent years:

Chart 5.1

The chemical industry's 98 percent increase in plant and equipment expenditures between 1983 and 1992 outpaced that of all manufacturing by 50 percentage points.

TABLE 5.1

NEW PLANT & EQUIPMENT EXPENDITURES IN THE UNITED STATES
(Billions of dollars)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Manufacturing	36.99	112.60	123.97	117.35	139.61	152.88	137.95	141.06	163.45	183.80	192.61	182.81	173.90	3.4%	4.3%	-4.9%
Chemicals & Allied Products	3.38	10.62	11.44	11.59	13.46	14.35	14.54	13.92	16.62	18.47	20.63	21.52	23.01	7.2%	10.6%	6.9%

Source: Bureau of the Census (Figures are on a company basis.)

TABLE 5.2

CAPITAL EXPENDITURES ABROAD BY MAJORITY-OWNED AFFILIATES OF U.S. COMPANIES (PLANT & EQUIPMENT)
(Billions of dollars)*

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Manufacturing	n/a	19.54	16.65	13.77	14.19	15.80	17.77	18.63	22.43	28.63	31.09	28.46	29.40	5.9%	9.6%	3.3%
Chemicals & Allied Products	n/a	2.97	3.35	2.37	2.47	2.81	3.30	4.01	4.90	6.44	6.90	6.51	6.56	7.0%	10.3%	0.8%

* Data series begin in 1977
Source: Bureau of Economic Analysis (Figures are on a company basis.)

TABLE 5.3

GROSS INVESTMENT
(Millions of dollars)

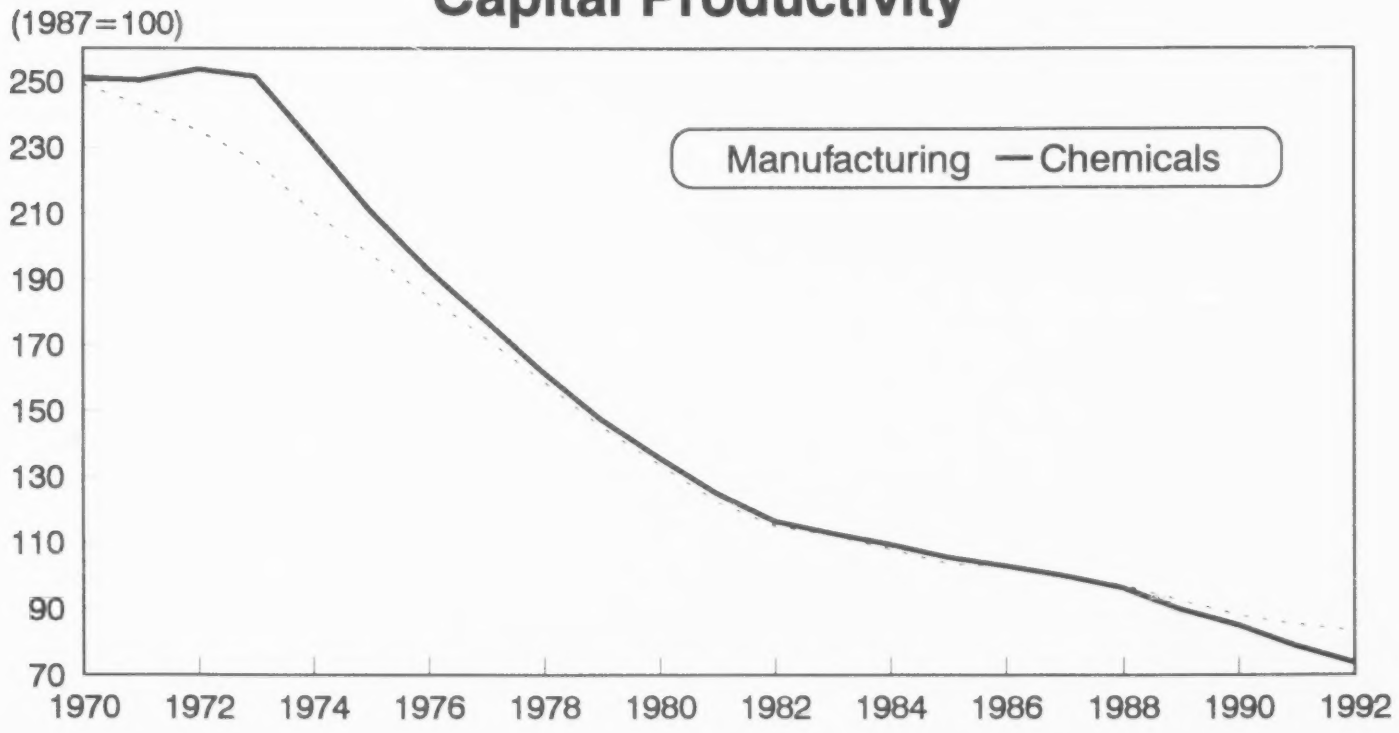
	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
In Current Dollars:																
Manufacturing	24,260	79,512	89,201	71,484	86,120	97,719	86,125	95,492	98,112	121,038	127,744	120,253	115,156	2.6%	3.8%	-4.2%
Chemicals & Allied Products	3,325	10,824	11,618	9,153	9,827	10,851	10,179	11,887	14,558	18,849	18,885	22,669	23,300	7.2%	14.4%	2.8%
In Constant 1987 Dollars:																
Manufacturing	71,403	102,692	98,377	77,061	90,693	102,109	87,663	95,492	95,502	114,011	117,773	109,636	106,265	0.8%	2.2%	-3.1%
Chemicals & Allied Products	9,761	14,188	13,076	10,073	10,560	11,483	10,420	11,887	14,110	17,596	17,146	20,125	20,568	4.6%	11.6%	2.2%

Source: Bureau of Economic Analysis (Figures are on an establishment basis.)

The productivity of capital in the chemical industry has fallen 71 percent since 1970 -- a reflection of rising costs for construction and for pollution control:

Chart 5.2

Capital Productivity



Capital productivity, or the productivity of net fixed investment, is herein defined as capacity divided by net capital stocks and indexed where 1987=100. This measure indicates how much existing facilities could produce if fully utilized. After steadily increasing during the 1950's and 1960's (largely because of technological progress), capital productivity began to decline in the 1970's. Higher plant construction costs and mandated environmental expenditures largely account for the decline. The trend is somewhat more pronounced in the chemical industry than for manufacturing as a whole.

TABLE 5.4

CHEMICAL INDUSTRY GROSS INVESTMENT, BY TYPE OF ASSET

(Millions of dollars)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
In Current Dollars:																
Total Gross Investment	3,325	10,824	11,618	9,153	9,827	10,851	10,179	11,887	14,558	18,849	18,885	22,669	23,300	7.2%	14.4%	2.8%
Producers Durable Equipment:	2,466	7,593	8,215	6,291	6,808	7,225	7,065	8,052	10,293	12,786	11,308	14,346	15,344	6.4%	13.8%	7.0%
Traditional Process Equipment	2,044	4,338	4,385	3,500	3,661	3,531	3,640	3,861	5,122	6,679	5,471	7,105	7,388	5.4%	13.9%	4.0%
Information Processing Equipment	358	2,966	3,391	2,393	2,642	3,023	2,857	3,524	4,316	5,241	5,022	6,265	6,737	7.1%	13.8%	7.5%
Other Equipment	64	289	439	398	505	671	568	667	855	866	815	976	1,219	10.8%	12.8%	24.9%
Buildings and Structures	859	3,231	3,403	2,862	3,019	3,626	3,114	3,835	4,265	6,063	7,577	8,323	7,956	8.9%	15.7%	-4.4%
In Constant 1987 Dollars:																
Total Gross Investment	9,761	14,188	13,076	10,073	10,560	11,483	10,420	11,887	14,110	17,596	17,146	20,125	20,568	4.6%	11.6%	2.2%
Producers Durable Equipment:	6,995	9,753	9,035	6,783	7,225	7,626	7,203	8,052	10,005	11,973	10,330	12,743	13,536	4.1%	10.9%	6.2%
Traditional Process Equipment	6,295	5,990	4,983	3,870	3,970	3,780	3,743	3,861	4,914	6,131	4,824	5,987	6,106	2.1%	9.6%	2.0%
Information Processing Equipment	541	3,405	3,571	2,487	2,741	3,166	2,916	3,524	4,286	5,055	4,775	5,913	6,404	6.0%	12.7%	8.3%
Other Equipment	159	358	481	426	514	680	544	667	805	787	731	843	1,026	7.9%	9.0%	21.7%
Buildings and Structures	2,766	4,435	4,041	3,290	3,335	3,857	3,217	3,835	4,105	5,623	6,816	7,382	7,032	5.7%	12.9%	-4.7%

Source: Bureau of Economic Analysis (data are on an establishment basis)

TABLE 5.5

CAPITAL STOCKS AND PRODUCTIVITY

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Gross Capital Stocks (Billion dollars)																
Manufacturing	253.3	628.3	779.8	833.1	899.0	973.6	1,034.0	1,100.7	1,167.3	1,254.1	1,344.9	1,425.4	1,498.1	6.7%	6.4%	5.1%
Chemicals & Allied Products	31.7	87.3	106.2	112.5	119.1	126.3	132.5	140.1	149.9	163.7	177.3	194.4	211.8	7.1%	8.6%	9.0%
Net Capital Stocks (Billion dollars)																
Manufacturing	163.6	421.4	525.6	552.4	590.9	636.9	667.6	704.3	740.2	795.1	852.2	897.8	934.4	5.9%	5.8%	4.1%
Chemicals & Allied Products	20.4	58.7	70.7	73.4	76.5	80.3	83.1	87.3	93.8	103.9	113.3	125.8	138.0	6.9%	9.6%	9.7%
Gross Capital Stocks (Billion 1987 dollars)																
Manufacturing	1,001.1	1,480.7	1,590.5	1,614.5	1,650.2	1,694.2	1,721.2	1,752.6	1,781.9	1,827.8	1,874.9	1,911.3	1,942.0	2.0%	2.1%	1.6%
Chemicals & Allied Products	119.5	192.1	206.0	208.3	210.9	213.9	215.5	218.1	222.6	230.5	237.8	248.0	258.4	2.3%	3.5%	4.2%
Net Capital Stocks (Billion 1987 dollars)																
Manufacturing	598.5	860.4	917.4	916.4	928.4	949.5	954.1	964.3	973.4	998.7	1,025.1	1,041.2	1,051.5	1.4%	1.7%	1.0%
Chemicals & Allied Products	72.5	113.7	119.6	118.6	118.2	118.6	117.9	118.7	121.5	127.6	132.8	140.6	148.3	2.2%	4.6%	5.5%
Capacity (% of 1987 Output)																
Manufacturing	70.9	98.2	105.2	107.9	111.1	115.2	119.3	122.6	125.2	128.0	130.8	133.3	135.7	2.6%	2.1%	1.8%
Chemicals & Allied Products	71.8	111.7	115.3	115.9	117.2	118.6	119.8	122.2	126.3	130.6	134.9	138.6	142.2	2.1%	3.1%	2.6%
Capital Productivity (1987=100) *																
Manufacturing	249.1	133.9	115.0	112.3	108.0	103.9	102.7	100.0	97.2	92.5	88.2	85.3	83.4	-3.2%	-3.6%	-2.2%
Chemicals & Allied Products	251.0	135.9	116.5	112.8	109.4	105.5	103.0	100.0	96.2	89.8	85.0	78.7	73.6	-4.5%	-5.9%	-6.5%

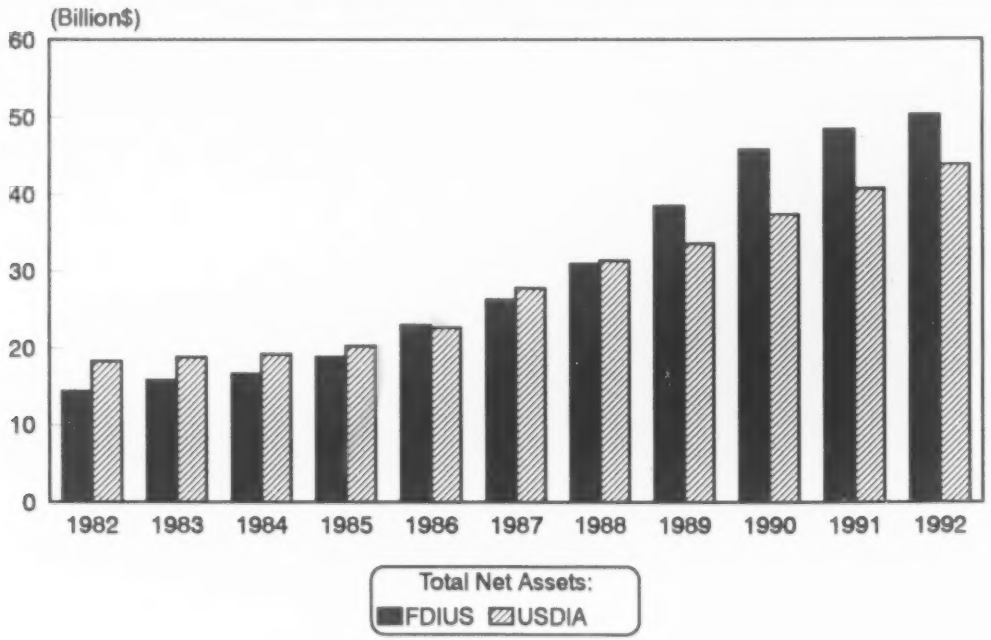
Source: Bureau of Economic Analysis, Federal Reserve Board, CMA analysis (data are on an establishment basis)

* Capital productivity (or the productivity of net fixed investment) is defined as capacity divided by net capital stocks in current dollars and indexed where 1987=100.

Since the early 1980s, the U.S. chemical industry has become more global in scope:

Chart 5.3

Chemical Industry: Direct Investment Positions to and from the U.S.



The position of foreign direct investment in the U.S. chemical industry (FDIUS) grew 250% between 1982 and 1992. (Foreign direct investment is defined as the ownership of 10 percent or more of the voting stock or equity of a company in another country.) Europeans were the dominant investors in U.S. chemicals. The U.S. chemical industry's direct investment position abroad (USDIA) grew 140% over the same period. At the end of 1992, the book value of foreign direct investment in the U.S. chemical industry was about $50 billion and that of U.S. investment in foreign chemical industries was $44 billion. The pattern is similar when measured in current-cost or in market-value terms. For more detail, see CMA's report "International Direct Investment in the U.S. Chemical Industry."

TABLE 5.6

INTERNATIONAL DIRECT INVESTMENT
(Billions of dollars) *

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Foreign Direct Investment in the United States (FDIUS)																
Position (foreign assets):																
Manufacturing	n/a	n/a	44.07	47.67	51.80	59.58	71.96	93.87	122.58	150.95	152.81	156.59	159.49	13.7%	11.2%	1.9%
Chemicals & Allied Products	n/a	n/a	14.38	15.78	16.63	18.84	22.95	26.29	30.93	38.41	45.75	48.41	50.26	13.3%	13.8%	3.8%
Capital Inflows to the US:																
Manufacturing	n/a	n/a	2.74	3.54	3.99	8.05	11.87	25.02	31.92	38.60	17.05	8.28	4.04	4.0%	-30.6%	-51.2%
Chemicals & Allied Products	n/a	n/a	0.68	1.39	0.83	1.95	4.11	7.04	5.75	13.34	8.46	3.49	2.25	12.7%	-20.4%	-35.5%
Income Payments from the US:																
Manufacturing	n/a	n/a	0.04	0.82	2.44	0.20	0.08	4.83	6.21	5.50	2.72	1.37	4.28	59.6%	-2.4%	212.4%
Chemicals & Allied Products	n/a	n/a	0.25	0.52	0.82	0.49	0.52	1.92	2.85	2.87	4.30	3.44	3.82	31.3%	14.7%	11.0%
Royalties and License Fees Paid by US Subsidiaries:																
Manufacturing	n/a	n/a	0.16	0.20	0.28	0.26	0.32	0.66	0.70	0.94	1.15	1.66	1.72	26.8%	21.1%	3.6%
Chemicals & Allied Products	n/a	n/a	0.11	0.10	0.14	0.16	0.20	0.36	0.43	0.58	0.62	1.03	1.17	26.7%	26.6%	13.6%
Net Charges for Other Services:																
Manufacturing	n/a	n/a	0.12	0.04	0.23	0.35	-0.06	0.36	0.29	0.34	0.25	0.09	0.19	4.7%	-12.0%	111.1%
Chemicals & Allied Products	n/a	n/a	0.05	-0.06	-0.06	-0.01	0.03	0.04	0.04	-0.05	0.08	0.04	-0.10			
U.S. Direct Investment Abroad (USDIA)																
Position (U.S. assets):																
Manufacturing	n/a	n/a	83.45	82.91	85.87	94.70	105.10	131.65	138.73	147.94	167.99	180.46	187.28	8.4%	7.3%	3.8%
Chemicals & Allied Products	n/a	n/a	18.27	18.79	19.20	20.27	22.65	27.79	31.37	33.56	37.35	40.71	43.82	9.1%	9.5%	7.6%
Capital Outlays:																
Manufacturing	n/a	n/a	4.06	2.86	6.73	5.57	5.86	12.65	8.08	17.20	14.89	13.04	15.78	14.5%	4.5%	21.0%
Chemicals & Allied Products	n/a	n/a	0.79	0.78	1.30	0.62	1.60	2.97	3.92	4.34	2.28	3.99	5.08	20.5%	11.3%	27.3%
Income Payments from Foreign Sourc																
Manufacturing	n/a	n/a	6.42	8.22	10.71	11.21	13.83	18.62	25.96	27.03	24.55	19.93	20.25	12.2%	1.7%	1.6%
Chemicals & Allied Products	n/a	n/a	1.38	1.78	2.26	2.15	3.57	4.23	6.31	5.92	5.63	5.92	6.06	15.9%	7.5%	2.4%
Royalties and License Fees Paid by Foreign Subsidiaries:																
Manufacturing	n/a	n/a	2.74	2.83	3.05	3.18	4.09	5.44	6.44	7.61	9.10	9.54	10.03	13.9%	13.0%	5.1%
Chemicals & Allied Products	n/a	n/a	0.63	0.63	0.68	0.67	0.77	0.97	1.33	1.37	1.81	2.00	2.29	13.8%	18.7%	14.5%
Net Charges for Other Services:																
Manufacturing	n/a	n/a	1.05	1.12	1.18	1.23	1.36	1.12	1.22	2.44	2.07	1.85	2.51	9.1%	17.5%	35.7%
Chemicals & Allied Products	n/a	n/a	0.26	0.31	0.28	0.31	0.31	0.32	0.39	0.58	0.58	0.66	0.67	9.9%	15.9%	1.5%

*Data series begin in 1982
Source: Bureau of Economic Analysis (data are on a historical or book-value basis)

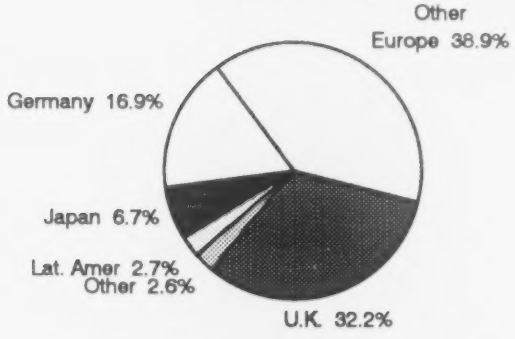
The bulk of foreign direct investment in the United States (FDIUS) is from European nations. Similarly, the great majority of U.S. direct investment abroad (USDIA) is in Europe.

Chart 5.4

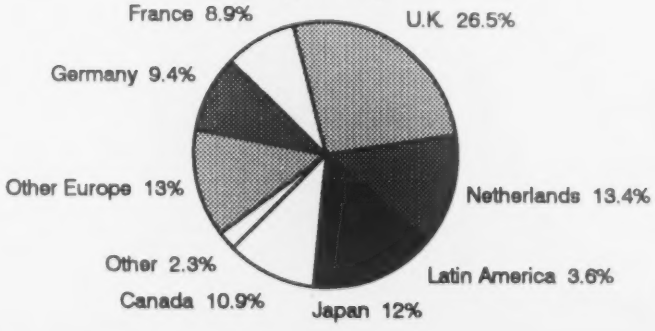
Geographic Composition of Foreign Direct Investment, 1992

FDIUS

Chemicals
($50.3 Bn)

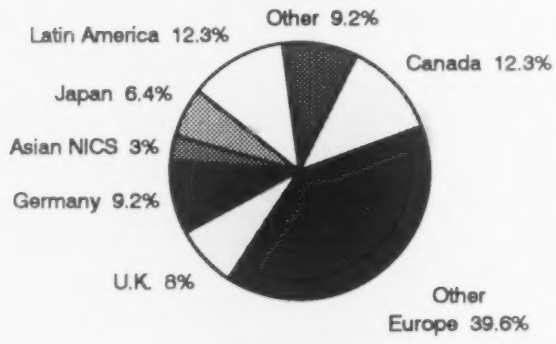


Manufacturing
($187.3)

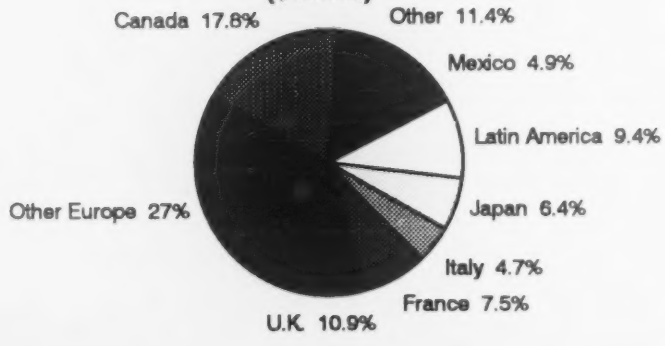


USDIA

Chemicals
($43.8 Bn)



Manufacturing
($159.5)



Section 6
Employment and Labor

The chemical industry is one of the manufacturing sector's most intensive consumers of capital and energy and one of the least intensive users of labor. Gross capital stocks per employee in the chemical industry — $197,800 in 1992 — are among the highest in American manufacturing (which averaged $82,400 per employee). Employing 1,070,900 workers in 1992, the chemical industry is nonetheless one of the largest U.S. industries in terms of employment. Since World War II, growth in the chemical industry has been accompanied by expanding employment and significant gains in labor productivity (i.e., output per man-hour).

Because of the highly technical and rapidly changing nature of its operations and products, research and development (R&D) and technical services provided to customers are increasingly important factors in companies' competitiveness. This, together with continuing increases in the automation of production processes, has caused the production worker portion of the industry workforce to decline modestly over the years. Production worker employment was 564,600 in 1992, 53 percent of the industry's total employment (as compared with 68 percent for manufacturing as a whole).

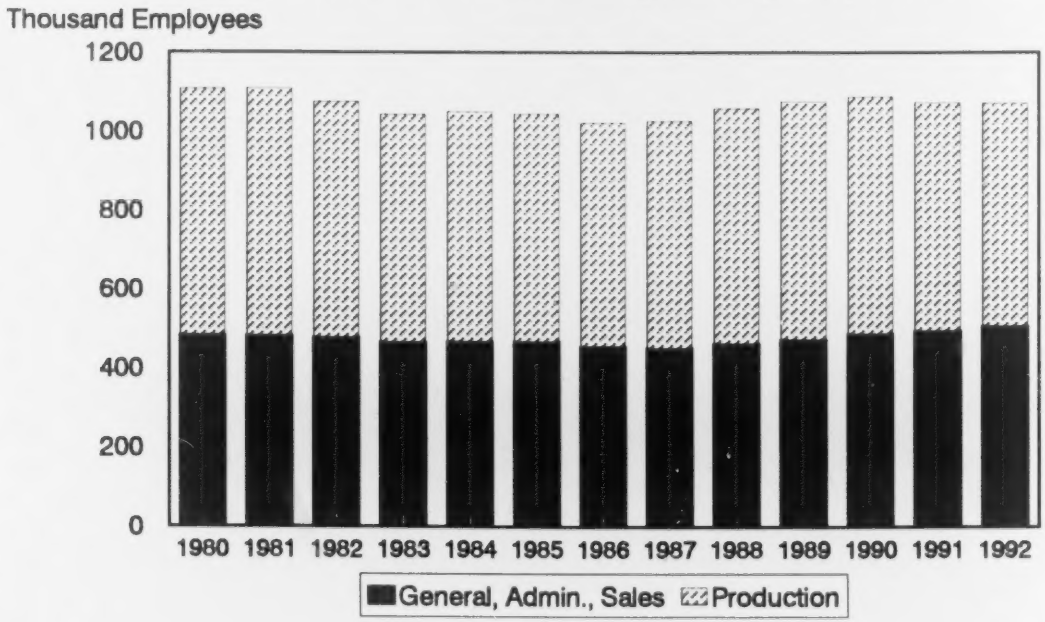
Thus, more than four out of every ten employees in chemicals are in administration, sales, technical servicing, R&D, and clerical positions. The industry employs over 82,000 scientists and engineers in R&D alone. This represents about 8 percent of total chemical industry employment, and over 14 percent of total R&D employment of scientists and engineers by the manufacturing sector in the United States.

The increasingly complex nature of the chemical industry requires new and more highly developed skills, and better trained and educated workers. In plant operations, this has resulted in making technicians out of skilled workers and skilled workers out of unskilled workers. In other areas, the need for chemists, chemical engineers, and other technically trained personnel (from agronomists to toxicologists to zoologists) continues to mount. The need for more technical production line skills and the increasing productivity of chemical industry workers has resulted in the chemical industry paying hourly production wages average 20 percent to 30 percent greater than those paid by manufacturing as a whole.

Employment in the U.S. chemical industry fell 1.5 percent over 1990-92, but is still only 3.4 percent below its all-time high reached in 1981:

Chart 6.1

Chemical Industry Employment



In contrast to the trend for the chemical industry overall, the pharmaceuticals industry added 14,100 jobs over 1990-92. Production workers' share of total chemical industry employment has gradually decreased over time, from 58 percent in 1970 to 53 percent in 1992.

TABLE 6.1

EMPLOYMENT
(Thousands)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Civilian Unemployment Rate	4.9%	7.1%	9.7%	9.6%	7.5%	7.2%	7.0%	6.2%	5.5%	5.3%	5.5%	6.7%	7.4%	-2.7%	3.6%	10.4%
Total Nonfarm	70,879	90,406	89,566	90,200	94,496	97,519	99,525	102,200	105,536	108,329	109,782	108,310	108,437	1.9%	1.2%	0.1%
Total Private Nonfarm	58,326	74,166	73,729	74,330	78,472	81,125	82,832	85,190	88,150	90,550	91,478	89,930	89,858	2.0%	1.1%	-0.1%
Manufacturing	19,366	20,285	18,780	18,433	19,378	19,259	18,964	19,024	19,350	19,442	19,117	18,455	18,190	-0.3%	-0.9%	-1.4%
Chemicals & Allied Products	1,049.3	1,107.4	1,075.1	1,042.7	1,049.3	1,044.1	1,021.8	1,025.9	1,059.0	1,076.2	1,087.6	1,072.4	1,070.9	0.0%	0.9%	-0.1%
Industrial Inorganic Chemicals	n/a	161.3	161.0	150.8	143.0	142.5	135.4	130.6	132.6	135.0	138.1	126.1	125.1	-2.5%	-0.9%	-0.8%
Plastics Materials and Synthetics	232.5	204.8	184.7	176.5	177.8	172.1	167.6	168.2	177.0	182.3	180.5	177.4	173.2	-0.6%	0.6%	-2.4%
Drugs	148.9	196.1	198.8	201.3	205.9	205.7	207.6	215.2	227.8	232.2	237.3	245.2	251.4	2.4%	3.2%	2.5%
Soap, Cleaners, and Toilet Goods	127.0	140.9	143.9	142.2	145.5	147.7	146.7	152.7	159.7	160.5	159.8	156.0	157.7	0.9%	0.6%	1.1%
Paints and Allied Products	69.9	65.1	59.9	59.7	62.0	63.5	62.9	62.6	63.3	62.5	61.2	57.9	57.0	-0.5%	-1.9%	-1.6%
Industrial Organic Chemicals	n/a	173.9	170.6	162.9	162.2	159.9	154.2	148.1	146.0	150.2	154.9	155.2	153.3	-1.1%	0.7%	-1.2%
Agricultural Chemicals	n/a	72.0	65.3	60.5	60.6	58.8	54.0	51.4	51.9	53.7	55.8	56.2	56.3	-1.5%	1.8%	0.2%
Miscellaneous Chemical Products	n/a	93.3	91.0	89.0	92.3	94.2	93.6	96.9	100.6	99.8	99.9	98.4	96.9	0.6%	0.0%	-1.5%

Source: Bureau of Labor Statistics

TABLE 6.2

EMPLOYMENT: PRODUCTION WORKERS
(Thousands)

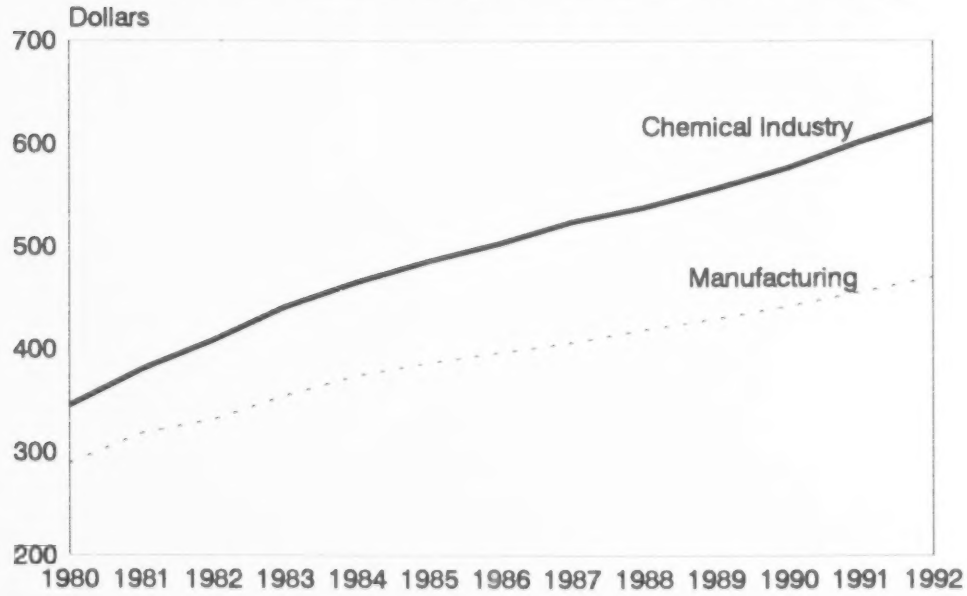
	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Manufacturing	14,044	14,214	12,741	12,529	13,284	13,092	12,876	12,969	13,220	13,269	12,979	12,467	12,345	-0.3%	-1.0%	-1.0%
Chemicals & Allied Products	604.0	625.8	598.6	578.6	583.0	577.8	568.0	575.3	597.0	604.6	600.7	579.0	564.6	-0.6%	-0.4%	-2.5%
Industrial Inorganic Chemicals	n/a	87.5	85.7	77.0	72.8	72.2	69.3	67.2	68.5	70.2	70.3	62.4	56.6	-4.1%	-3.4%	-9.3%
Plastics Materials and Synthetics	142.9	136.6	119.3	114.6	117.3	114.4	112.7	110.9	115.8	118.9	116.3	110.1	104.3	-1.3%	-1.2%	-5.3%
Drugs	72.6	96.7	98.2	98.2	96.2	94.8	96.0	98.7	101.0	101.9	105.3	108.3	111.0	1.2%	2.4%	2.5%
Soap, Cleaners, and Toilet Goods	72.9	85.8	90.2	89.1	92.6	93.5	92.8	97.5	102.7	101.2	98.6	95.6	95.9	0.6%	-0.3%	0.3%
Paints and Allied Products	39.1	32.9	28.9	29.2	30.4	30.6	30.3	30.7	31.3	31.6	31.0	29.5	29.7	0.3%	-0.7%	0.7%
Industrial Organic Chemicals	n/a	88.1	85.8	83.6	82.4	81.5	81.2	83.1	86.3	87.8	85.9	80.8	76.1	-1.2%	-1.7%	-5.8%
Agricultural Chemicals	n/a	45.4	39.6	36.5	37.5	36.6	33.1	32.3	33.2	33.6	34.3	34.0	33.5	-1.7%	0.7%	-1.5%
Miscellaneous Chemical Products	n/a	52.8	50.9	50.5	53.7	54.2	52.6	54.9	58.2	59.4	59.1	58.3	57.5	1.2%	0.9%	-1.4%

Source: Bureau of Labor Statistics

Weekly earnings in the chemical industry have been consistently above those in manufacturing as a whole:

Chart 6.2

Weekly Earnings:
Chemical Industry vs. Manufacturing



Average weekly earnings for chemical production workers increased by an average of 4.3 percent per year between 1982 and 1992. Manufacturing workers' weekly pay increased by an average of 3.6 percent per year over the same period. During the same period consumer prices increased by an average of 3.8 percent per year.

TABLE 6.3

AVERAGE HOURLY EARNINGS: PRODUCTION WORKERS
(Dollars per Hour)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Total Private Nonfarm	3.23	6.66	7.68	8.02	8.31	8.57	8.76	8.98	9.28	9.65	10.01	10.33	10.59	3.3%	3.4%	2.5%
Manufacturing	3.35	7.28	8.50	8.83	9.19	9.54	9.73	9.91	10.19	10.48	10.83	11.18	11.45	3.0%	2.9%	2.4%
Chemicals & Allied Products	3.69	8.31	9.97	10.58	11.07	11.57	11.97	12.36	12.71	13.09	13.54	14.02	14.45	3.8%	3.2%	3.1%
Industrial Inorganic Chemicals	n/a	9.08	11.02	11.66	12.30	12.80	13.11	13.56	13.83	14.20	14.66	15.03	15.67	3.6%	2.9%	4.3%
Plastics Materials and Synthetics	3.62	8.21	9.88	10.55	11.10	11.72	12.13	12.60	13.06	13.43	13.97	14.78	15.34	4.5%	4.0%	3.8%
Drugs	3.54	7.69	9.08	9.71	10.23	10.75	11.15	11.62	12.07	12.52	12.90	13.46	14.04	4.5%	3.9%	4.3%
Soap, Cleaners, and Toilet Goods	3.64	7.67	9.12	9.64	9.90	10.28	10.76	10.90	11.05	11.26	11.71	12.03	12.04	2.8%	2.0%	0.1%
Paints and Allied Products	3.47	7.39	8.80	9.33	9.75	10.08	10.44	10.84	11.24	11.67	11.99	12.47	12.65	3.7%	3.1%	1.4%
Industrial Organic Chemicals	n/a	9.67	11.85	12.73	13.43	13.98	14.39	14.89	15.30	15.65	15.97	16.53	17.24	3.8%	3.0%	4.3%
Agricultural Chemicals	n/a	8.13	9.71	10.25	10.74	11.05	11.45	11.92	12.36	12.84	13.74	14.18	14.70	4.2%	4.3%	3.7%
Miscellaneous Chemical Products	n/a	7.75	9.22	9.62	10.09	10.61	11.07	11.36	11.53	11.91	12.28	12.61	13.06	3.5%	2.8%	3.6%

Source: Bureau of Labor Statistics

TABLE 6.4

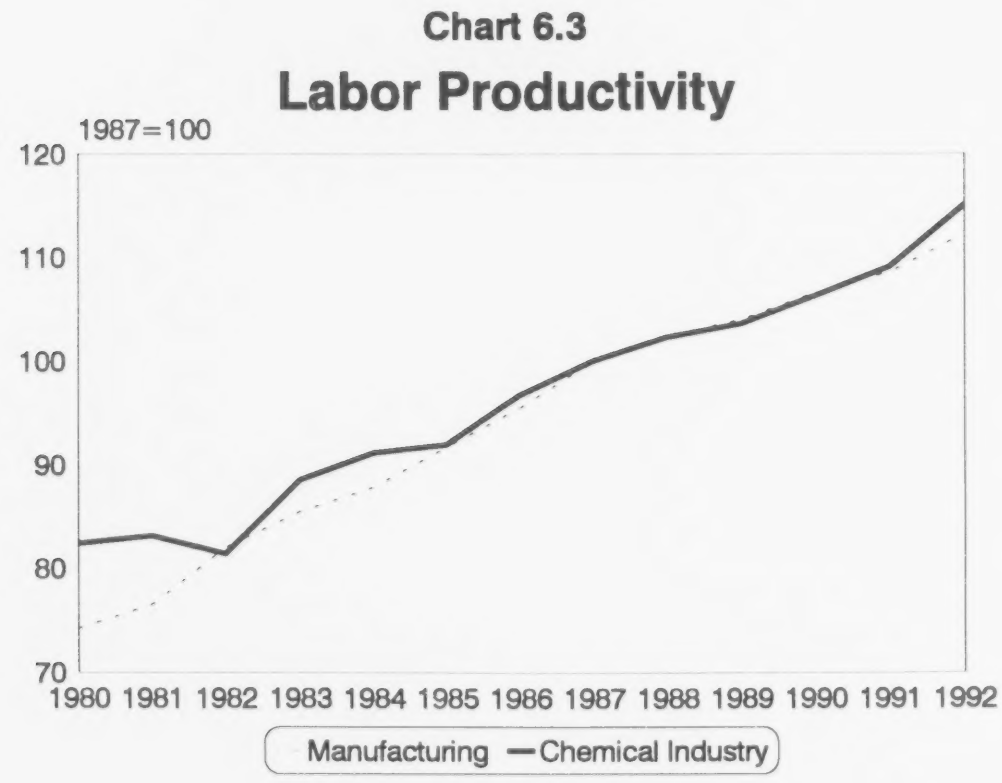
AVERAGE WEEKLY EARNINGS: PRODUCTION WORKERS
(Dollars per Week)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Total Private Nonfarm	119.73	234.78	267.18	280.49	292.49	299.06	304.41	312.09	321.95	333.88	345.24	354.14	364.42	3.2%	3.1%	2.9%
Manufacturing	133.54	288.88	330.83	354.05	373.79	386.48	396.56	406.08	418.61	429.44	441.38	454.92	469.72	3.6%	3.0%	3.3%
Chemicals & Allied Products	153.52	344.43	407.50	439.96	464.07	484.62	502.17	523.18	537.09	555.44	576.23	601.17	623.24	4.3%	3.6%	3.7%
Industrial Inorganic Chemicals	n/a	376.59	445.67	484.04	518.16	533.38	551.26	574.88	590.55	606.11	629.81	656.07	681.72	4.3%	3.5%	3.9%
Plastics Materials and Synthetics	151.37	339.69	401.48	442.87	468.63	495.47	511.46	542.63	567.09	579.02	593.87	630.85	671.79	5.3%	4.4%	6.5%
Drugs	143.54	315.50	373.14	398.78	416.13	441.38	463.69	483.41	496.50	522.16	538.85	572.86	596.93	4.8%	4.3%	4.2%
Soap, Cleaners, and Toilet Goods	149.50	310.28	370.57	396.40	408.91	421.78	441.76	447.99	444.29	452.27	477.38	491.44	496.94	3.0%	2.1%	1.1%
Paints and Allied Products	140.83	297.80	348.13	382.27	406.57	417.53	433.73	451.58	471.53	487.78	502.29	521.49	525.66	4.2%	3.1%	0.8%
Industrial Organic Chemicals	n/a	413.86	496.62	540.45	578.14	605.93	624.45	655.97	670.27	698.43	721.76	754.22	785.91	4.7%	3.7%	4.2%
Agricultural Chemicals	n/a	352.61	407.86	431.26	459.28	471.90	482.67	510.67	535.76	557.07	605.03	629.69	654.50	4.8%	5.1%	3.9%
Miscellaneous Chemical Products	n/a	317.78	373.45	397.33	421.57	443.80	457.77	470.82	485.30	504.79	520.80	533.58	556.72	4.1%	3.4%	4.3%

Source: Bureau of Labor Statistics

Labor productivity in the U.S. chemical industry has improved significantly since 1980:

Chart 6.3



Labor productivity in the chemical industry rose by an average of 3.5 percent per year from 1982 to 1992, slightly above the 3.2 percent manufacturing average.

TABLE 6.5

AVERAGE WEEKLY WORKING HOURS: PRODUCTION WORKERS

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Total Private Nonfarm	37.1	35.3	34.8	35.0	35.2	34.9	34.8	34.8	34.7	34.6	34.5	34.3	34.4	-0.1%	-0.2%	0.3%
Manufacturing	39.8	39.7	38.9	40.1	40.7	40.5	40.7	41.0	41.1	41.0	40.8	40.7	41.0	0.5%	0.0%	0.7%
Chemicals & Allied Products	41.6	41.5	40.9	41.6	41.9	41.9	41.9	42.3	42.3	42.4	42.6	42.9	43.1	0.5%	0.4%	0.5%
Industrial Inorganic Chemicals	n/a	41.5	40.5	41.5	42.1	41.7	42.1	42.4	42.7	42.7	42.9	43.6	43.5	0.7%	0.5%	-0.2%
Plastics Materials and Synthetics	41.8	41.4	40.6	42.0	42.2	42.3	42.2	43.1	43.4	43.1	42.5	42.7	43.8	0.8%	0.3%	2.6%
Drugs	40.5	41.0	41.1	41.1	40.7	41.0	41.6	41.6	41.1	41.7	41.8	42.5	42.5	0.3%	0.4%	0.0%
Soap, Cleaners, and Toilet Goods	41.0	40.5	40.6	41.1	41.3	41.0	41.1	41.1	40.2	40.1	40.8	40.9	41.3	0.2%	0.1%	1.0%
Paints and Allied Products	40.5	40.3	39.6	41.0	41.7	41.4	41.6	41.7	41.9	41.8	41.9	41.8	41.6	0.5%	0.0%	-0.5%
Industrial Organic Chemicals	n/a	42.8	41.9	42.4	43.0	43.3	43.4	44.1	43.8	44.6	45.2	45.6	45.6	0.8%	0.7%	0.0%
Agricultural Chemicals	n/a	43.4	42.0	42.1	42.8	42.7	42.2	42.8	43.3	43.4	44.0	44.4	44.5	0.6%	0.8%	0.2%
Miscellaneous Chemical Products	n/a	41.0	40.5	41.3	41.8	41.8	41.3	41.5	42.1	42.4	42.4	42.3	42.6	0.5%	0.5%	0.7%

Source: Bureau of Labor Statistics

TABLE 6.6

LABOR PRODUCTIVITY INDEX
(1987=100)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Total Private Nonfarm	81.8	91.4	92.3	94.5	96.5	97.2	99.3	100.0	100.8	99.9	99.9	100.4	103.1	1.1%	0.6%	2.7%
Manufacturing	53.6	74.2	82.0	85.5	87.8	91.7	95.5	100.0	102.4	104.0	106.6	108.6	112.2	3.2%	2.3%	3.3%
Chemicals & Allied Products	54.2	82.4	81.4	88.5	91.1	91.9	96.7	100.0	102.3	103.6	106.3	109.1	115.0	3.5%	2.8%	5.4%
Industrial Inorganic Chemicals	n/a	75.8	71.1	82.1	90.0	91.1	93.1	100.0	102.0	103.1	112.3	121.1	149.2	7.7%	8.3%	23.2%
Plastics Materials and Synthetics	31.6	60.2	70.7	83.7	85.7	85.8	92.1	100.0	99.1	100.3	102.2	104.6	115.2	5.0%	2.9%	10.1%
Drugs	64.1	83.0	84.1	87.6	91.2	93.4	99.4	100.0	103.6	104.9	105.0	107.4	112.5	3.0%	2.4%	4.7%
Soap, Cleaners, and Toilet Goods	91.1	119.4	97.5	99.9	94.8	95.3	101.6	100.0	103.2	105.7	108.9	111.1	106.2	0.9%	1.2%	-4.4%
Paints and Allied Products	65.8	84.1	88.1	90.7	92.7	96.6	99.2	100.0	100.5	95.7	95.6	94.0	97.2	1.0%	-0.6%	3.4%
Industrial Organic Chemicals	n/a	90.1	82.5	92.8	96.4	97.6	98.8	100.0	108.1	110.2	112.7	115.0	119.8	3.8%	3.7%	4.2%
Agricultural Chemicals	n/a	68.3	73.8	78.8	87.9	85.0	87.6	100.0	102.3	109.4	109.3	106.5	115.1	4.5%	2.9%	8.1%
Miscellaneous Chemical Products	n/a	84.3	91.3	94.2	88.1	88.8	101.3	100.0	94.1	92.0	93.9	92.1	90.0	-0.1%	-2.1%	-2.3%

Source: Bureau of Labor Statistics, Federal Reserve Board, CMA analysis

TABLE 6.7

UNIT LABOR COSTS
(1987=100)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Total Private Nonfarm	37.1	76.0	88.7	90.1	91.7	94.7	97.4	100.0	103.2	107.6	113.4	118.6	119.7	3.0%	3.7%	0.9%
Manufacturing	63.1	99.0	104.5	104.1	105.6	104.9	102.8	100.0	100.4	101.7	102.5	103.9	103.0	-0.1%	0.6%	-0.9%
Chemicals & Allied Products	55.1	81.6	99.1	96.6	98.3	101.8	100.2	100.0	100.5	102.2	103.0	103.9	101.7	0.3%	0.3%	-2.1%
Industrial Inorganic Chemicals	n/a	88.3	114.2	104.7	100.8	103.6	103.9	100.0	100.0	101.5	96.4	91.6	77.5	-3.8%	-5.0%	-15.4%
Plastics Materials and Synthetics	91.1	108.3	110.8	100.0	102.8	108.4	104.5	100.0	104.6	106.2	108.5	112.2	105.7	-0.5%	1.1%	-5.8%
Drugs	47.6	79.7	92.9	95.4	96.6	99.1	96.6	100.0	100.3	102.7	105.7	107.9	107.5	1.5%	1.5%	-0.4%
Soap, Cleaners, and Toilet Goods	36.7	58.9	85.8	88.5	95.7	98.9	97.1	100.0	98.2	97.7	98.6	99.3	103.9	1.9%	0.8%	4.6%
Paints and Allied Products	48.8	81.1	92.1	94.9	97.1	96.3	97.0	100.0	103.2	112.5	115.6	122.4	120.0	2.7%	3.7%	-2.0%
Industrial Organic Chemicals	n/a	72.1	96.5	92.1	93.6	96.2	97.8	100.0	95.1	95.4	95.2	96.5	96.6	0.0%	-0.7%	0.1%
Agricultural Chemicals	n/a	99.8	110.4	109.1	102.4	109.0	109.6	100.0	101.4	98.4	105.5	111.6	107.2	-0.3%	1.4%	-3.9%
Miscellaneous Chemical Products	n/a	80.9	88.9	90.0	100.7	105.1	96.3	100.0	107.9	114.0	115.1	120.6	127.8	3.7%	5.0%	6.0%

Source: Bureau of Labor Statistics, Federal Reserve Board, CMA analysis

TABLE 6.8

MANUFACTURING LABOR PRODUCTIVITY BY NATION
(1982=100)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
United States	77.2	94.4	100.0	102.9	105.6	108.0	112.6	117.2	122.0	122.5	125.7	128.1	n/a
Canada	76.9	99.9	100.0	107.3	116.3	119.8	117.9	119.0	119.5	119.0	120.1	121.7	n/a
Japan	52.0	92.1	100.0	101.9	106.1	112.0	110.3	119.5	126.5	135.2	144.2	146.5	n/a
Belgium	44.3	87.5	100.0	110.9	115.8	117.2	118.2	120.1	125.2	131.2	133.9	137.0	n/a
Denmark	57.2	98.0	100.0	104.9	104.3	105.0	98.9	98.4	102.1	105.6	106.2	109.3	n/a
France	58.5	90.6	100.0	102.5	104.5	108.8	110.8	113.0	121.0	127.9	129.4	129.1	n/a
Germany	67.0	98.4	100.0	105.3	108.9	112.9	113.4	111.5	115.5	119.0	122.9	125.4	n/a
Italy	54.6	95.5	100.0	105.2	115.7	122.3	123.7	127.2	130.5	135.1	140.6	145.2	n/a
Netherlands	52.9	93.9	100.0	106.6	115.0	118.7	119.1	118.7	122.3	126.3	126.6	128.6	n/a
Norway	74.5	96.3	100.0	105.2	112.6	116.0	114.6	120.4	119.7	125.9	129.7	133.5	n/a
Sweden	68.9	96.2	100.0	106.5	111.7	112.4	114.3	115.3	117.3	120.0	121.0	122.4	n/a
United Kingdom	70.9	89.9	100.0	108.5	114.0	118.2	122.9	130.4	137.5	143.5	146.0	149.8	n/a

Source: Bureau of Labor Statistics
Note: These data differ in concept from those published in Table 6.6.

Between 1980 and 1990, U.S. manufacturing productivity grew significantly, by 33.2 percent. Among the 12 industrialized countries listed above, however, the U.S. ranked only ninth in productivity growth over this period.

Section 7
Health, Safety, and the Environment

In recent years there have been major advances in protecting the nation's environment and the health and safety of its workers. Pollution of the air, water, and land has been declining even while production has been increasing, and many steps have been taken to improve worker health and safety.

These advances have been achieved in part as a result of the development of new technologies and continuing investments in new equipment, processes and procedures. In addition, voluntary health, safety, and environmental improvement actions by industry often go beyond the minimum standards set by regulations. But the advances also stem partly from a large number of federal and state laws and the implementing rules and regulations that set standards for government, industry, and consumer behavior.

"Basic" or "primary" industries, such as chemicals, are among those most heavily regulated for environmental reasons. This is because transforming raw materials from the earth into products used by other industries -- the task of basic industries -- can generate substantial amounts of pollution. Industry, however, is not typically the largest generator of pollution in the United States. For example, industrial processes generated only about 14.5 percent of U.S. emissions of sulfur dioxide in 1990 and only about 20.3 percent of the U.S. emissions of carbon dioxide, the emission that many believe will lead to "global warming."

During the past two decades, the U.S. chemical industry has constructed an extensive program to reduce emissions of the many types of materials that contribute to air, water, and land pollution. The industry's environmental actions have necessitated capital expenditures for pollution abatement and control that have totalled nearly $17 billion since 1973. In 1991, the chemical industry's capital expenditures for pollution abatement and control were $2.1 billion, about 10 percent of chemical industry fixed capital investment and about 28 percent of pollution abatement and control expenditures by all manufacturing industries. With passage of the Clean Air Act Amendments of 1990, as much as 25 to 30 percent of the industry's fixed capital investment may soon be allocated to pollution abatement and control.

The period since the early 1970s has also witnessed increasing gross annual operating costs (depreciation, labor, material and supplies, services, etc.) for pollution abatement and control. At $4 billion in 1991, these pollution abatement and control operating costs represented about 1.4 percent of value of the chemical industry's shipments. In 1991, the chemical industry accounted for about 23 percent of all manufacturing gross annual operating costs for pollution abatement and control.

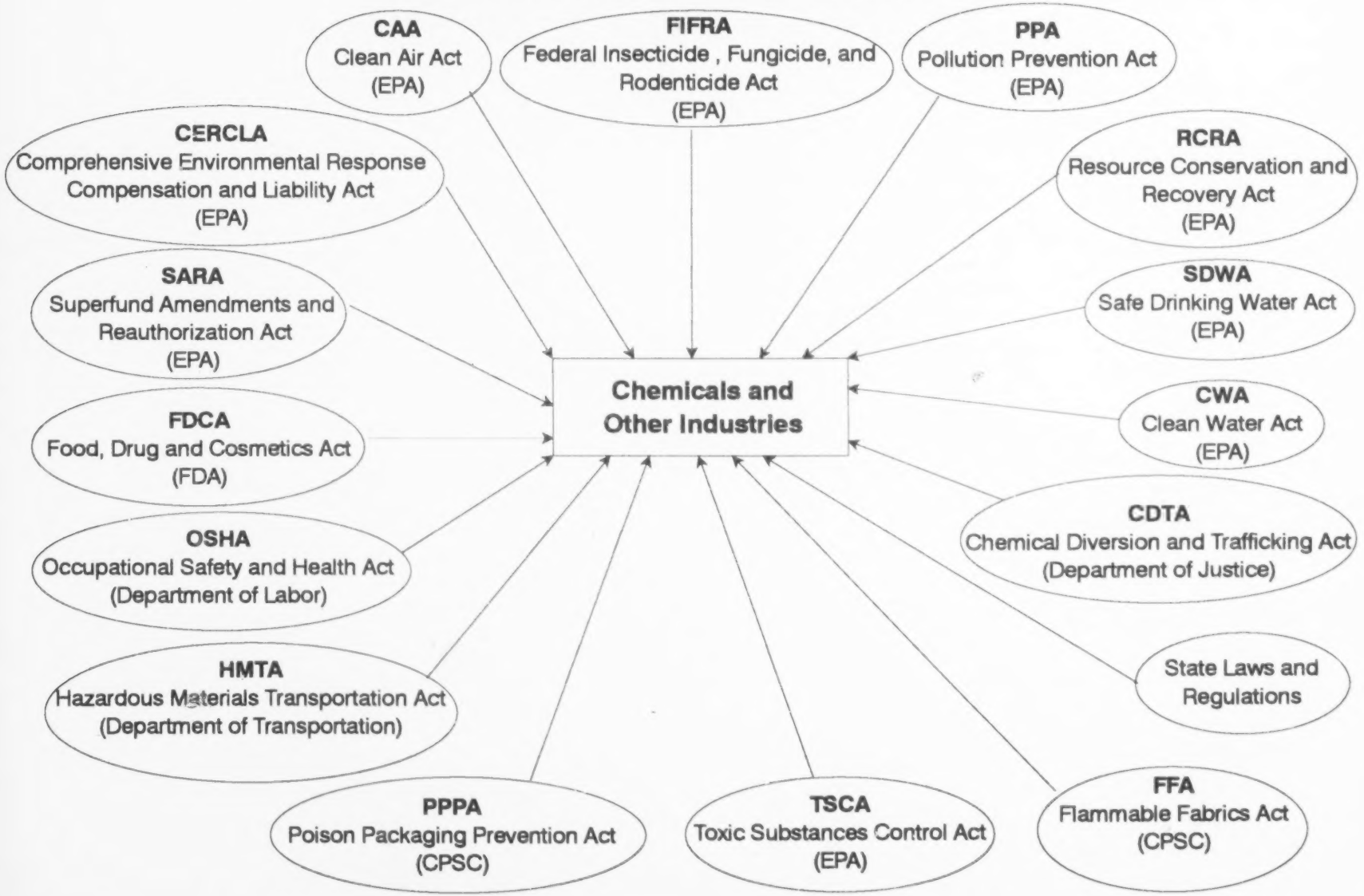
Ever tightening regulations have raised the costs of pollution control incurred by all sectors of the economy as recorded by government data to about 2 percent of GNP by 1991, with EPA forecasting increases to about 3 percent of GNP by the year 2000. Initially, much of this cost falls on U.S. industry. But in the end all of the costs of environmental improvement are passed on to individual members of the economy; whether by higher prices for products, lower wages for workers, or through lower profits that reduce capital investment, productivity gains, and U.S. industry's international competitiveness. New environmental programs being proposed at Federal, government and state levels will likely further increase the difficulty and costs of compliance. Moreover, government data do not capture all of the costs of pollution control measures to the economy. Cost-effective solutions to environmental problems are, therefore, in everyone's interests.

The U.S. chemical industry has achieved a remarkable record of worker safety, much better than manufacturing as a whole and other sectors of the economy. This record has continually improved during the post-World War II period, largely as a result of elimination of job hazards and the industry's initiatives in implementing effective safety programs.

This section describes some of the key health, safety and environmental laws affecting the chemical industry, provides some key measures of environmental progress, presents U.S. government data describing the costs of pollution abatement, and includes chemical industry illness and injury statistics.

Figure A

Some Major Health Safety and Environmental Laws Regulating Chemicals and Other U.S. Industries



Health, Safety, and Environmental Legislation

A growing number of state and federal laws set the framework for health, safety, and environmental regulation, these include:

Toxic Substances Control Act (TSCA) of 1976 gives the Environmental Protection Agency (EPA) comprehensive authority to regulate any chemical substance whose manufacture, processing, distribution in commerce, use or disposal may present an unreasonable risk of injury to health or the environment. Among other requirements, it mandates that chemical companies submit premanufacture notices that provide information on health and environmental effects for each new product and test existing products for these effects. It also gives EPA authority to prohibit, limit or ban the manufacture, process, and use of chemicals. TSCA remains in force through a continuing resolution.

Clean Air Act first passed in 1955, provides EPA authority to regulate air pollutants from automobiles, electric power plants, chemical plants and other industrial sources. Its 1990 amendments set control standards for industrial sources of 41 pollutants to be met by 1995 and for 148 other pollutants to be reached by 2003.

Clean Water Act first passed in 1972 and amended in 1977 and 1987, provides EPA authority to regulate effluents from sewage treatment works, chemical plants, and other industrial sources into waters. The Act also asks states to identify and alleviate pollution problems. There is a proposal in Congress to reauthorize the Act.

Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA) provide the basic legal framework for the Federal "Superfund" program to clean up abandoned hazardous waste sites. The 1980 CERCLA Legislation imposed specific taxes on chemicals and petroleum to fund the clean up program. The 1986 SARA legislation extended these taxes for five years and adopted a new broad-based corporate environmental tax. In 1990 these taxes were extended for an additional four years. Title III of the 1986 SARA legislation also established "right to know" standards that require petroleum refineries, chemical plants, and other industrial facilities annually to provide information to the public about stored toxic substances and annual releases of substances into the environment, known as the toxic release inventory (TRI).

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) provides EPA authority to register and assess the risks of agricultural pesticides, industrial biocides, and other non-agricultural pesticides. It was first enacted in 1947 and last amended in 1988.

Food, Drug and Cosmetics Act (FDCA) provides the Food and Drug Administration (FDA) authority to regulate the manufacturing of drugs and pharmaceuticals and the use of packaging and additives in food and cosmetics. It was first enacted in 1906 and there have been numerous revisions over the years. There are no established reauthorization dates.

Resource Conservation and Recovery Act (RCRA) of 1976 provides EPA with authority to establish standards and regulations for handling and disposing of solid and hazardous wastes. The act also requires companies to establish programs to reduce the volume and toxicity of hazardous wastes. It was last amended in 1984 with tighter standards. Reauthorization and amendment efforts for RCRA began in 1990.

Occupational Safety and Health Act provides the Department of Labor authority to set comprehensive workplace safety and health standards, including permissible exposures to chemicals in the workplace, and authority to conduct inspections and issue citations for violations of safety and health regulations.

Safe Drinking Water Act, enacted in 1974 and amended in 1977 and again in 1986, establishes standards for public drinking water supplies.

Hazardous Materials Transportation Act (HMTA) provides the Department of Transportation the authority to regulate the movement of hazardous materials.

Chemical Diversion and Trafficking Act (CDTA) of 1988 is designed to prevent the diversion of chemicals to illegal drug producers. It gives the Drug Enforcement Agency the authority to control exports of chemicals to designated drug source countries.

Pollution Prevention Act makes it the national policy of the United States to reduce or eliminate the generation of waste at the source whenever feasible and directs the EPA to undertake a multi-media program of information collection, technology transfer, and financial assistance to the States to implement this policy and to promote the use of source reduction techniques.

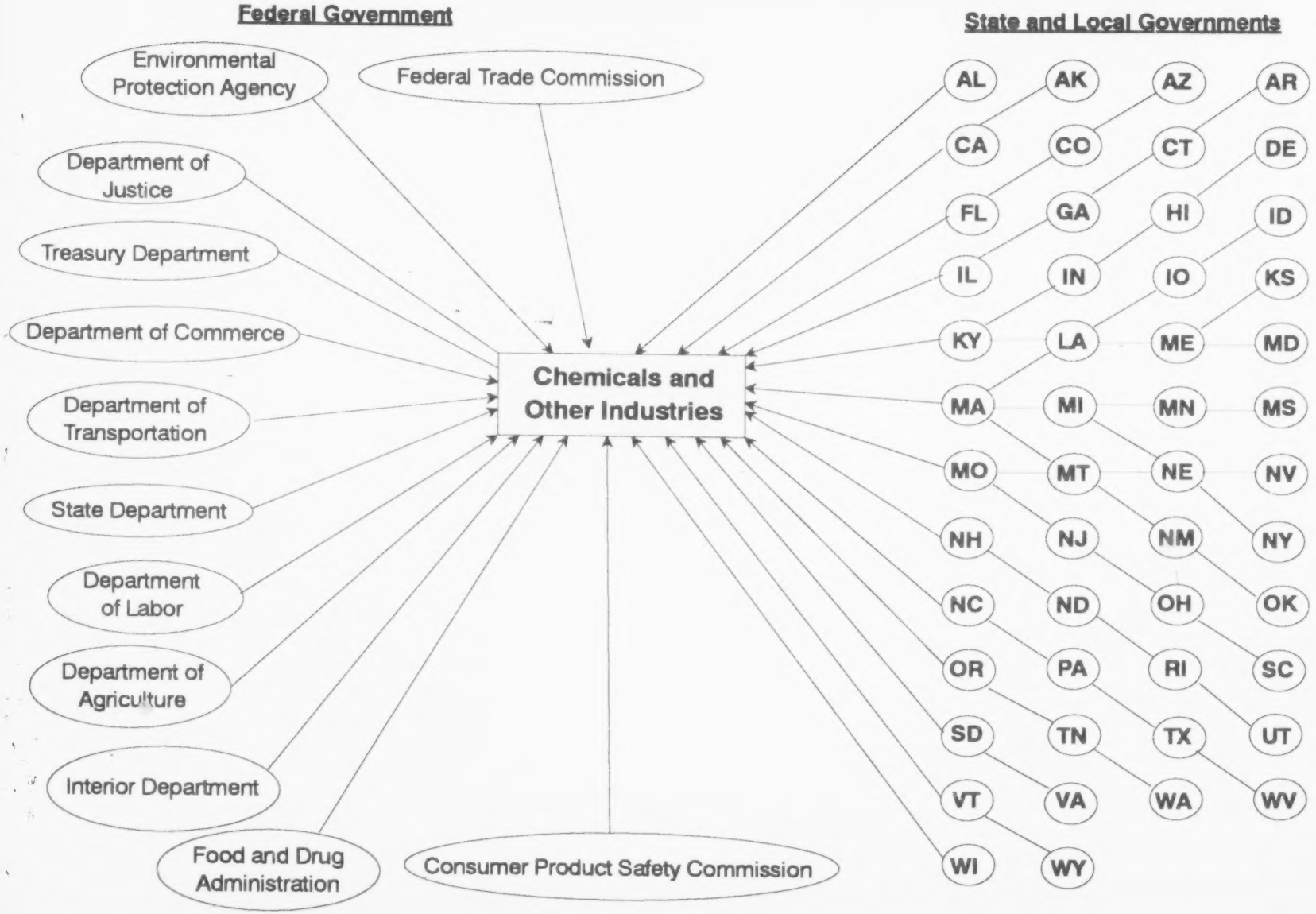
Flammable Fabrics Act, enacted in 1970 and last amended in 1983, gives the Consumer Product Safety Commission the authority to set flammability standards for fabrics that protect against an unreasonable risk of the occurrence of a fire.

Poison Packaging Prevention Act of 1953 and last amended in 1990, provides the Consumer Product Safety Commission authority to set standards for the special packaging of any household product to protect children from a hazard.

State Regulations. State governments are increasingly active in the environmental and safety areas. In addition to the state implementation role in many federal programs, the states themselves are active in a range of issues that impact the chemical industry. These include hazardous waste, toxics use reduction, chemical specific taxes and fees, and state right-to-know statutes.

Figure B

Key Administrators of Environmental, Health and Safety Regulations



Key Administrators of Environmental, Health, and Safety Regulations

Federal, state, and local laws on environmental, health, and safety matters are often detailed, complex, and lengthy. Rarely, however can these laws be written in sufficient detail to allow enforcement without even more detailed regulations that interpret -- and amplify on -- the language contained in the legislation. The regulations, or "rulings" are published in the Federal Register, the means by which very detailed mandates and directions are communicated to business and the public. For example, a recent ruling setting standards for 23 organic and inorganic chemicals that may be found in drinking water occupied 424 pages of triple column fine print in the Federal Register.

Another example: the text of the Clean Air Act Amendments of 1990 itself totalled some 314 pages of legal codes. The task of formulating regulations to implement this new law, however, has only begun and is expected to result in some 70 regulations over the first two years. Two example rulings may give an indication of the volume and complexity of these regulations. The recently promulgated Operating Permit Program rules occupied 62 pages of the Federal Register. And the Hazardous Organic NESHAP (National Emissions Standards for Hazardous Air Pollutants) ruling is expected to require about 300 pages of Federal Register text.

The formulation of effective, pragmatic regulations that take into account wide differences in the companies, processes, and products to be regulated is a difficult and time-consuming task that must be performed by the agency assigned responsibility by the legislation. Formulating detailed, complex regulations and disseminating them is costly. So is industry compliance and reporting. The current costs of pollution control alone are estimated by the Environmental Protection Agency to be equivalent to almost 2 percent of GNP in 1991 and are projected by EPA to rise to nearly 3 percent of GNP by the year 2000.

Environmental matters, however, are only one part of an upward trend of government regulation. In October, 1991, the government reported that 59 federal agencies were then at work on 4,863 regulations, of which 9,129 were new to the governments' agenda. (The Costs of Federal Regulation, by Thomas D. Hopkins). After declining modestly during part of the 1980s the Federal Register page count set a new record of 67,716 pages in 1991. In 1992, even a five month Bush Administration "moratorium" during which agencies were to refrain from issuing non-essential new rules and regulations reduced the page count only modestly, to 62,919. In the first seven months on 1993 the page count reached 41,019, indicating a 1993 total that will probably top 70,000 pages, a new record.

The costs and difficulty industry faces in complying with regulations are increasing not only with the number of federal laws and agencies that must be satisfied but also as a result of the increasing intervention of state and local governments into setting health, safety and environmental standards. Thus, in some cases, companies must be concerned not only about federal standards but as well about those of 50 individual states—each of which has its own complex of departments and agencies who write and enforce regulations. In some instances, county and city governments also set their own regulatory standards.

Regulation is an essential tool of government policy but it is an expensive one. Writing, promulgating, and administering government regulations costs government tax money. But for the most part, federal and state regulatory requirements create costs that do not show up in government budgets.

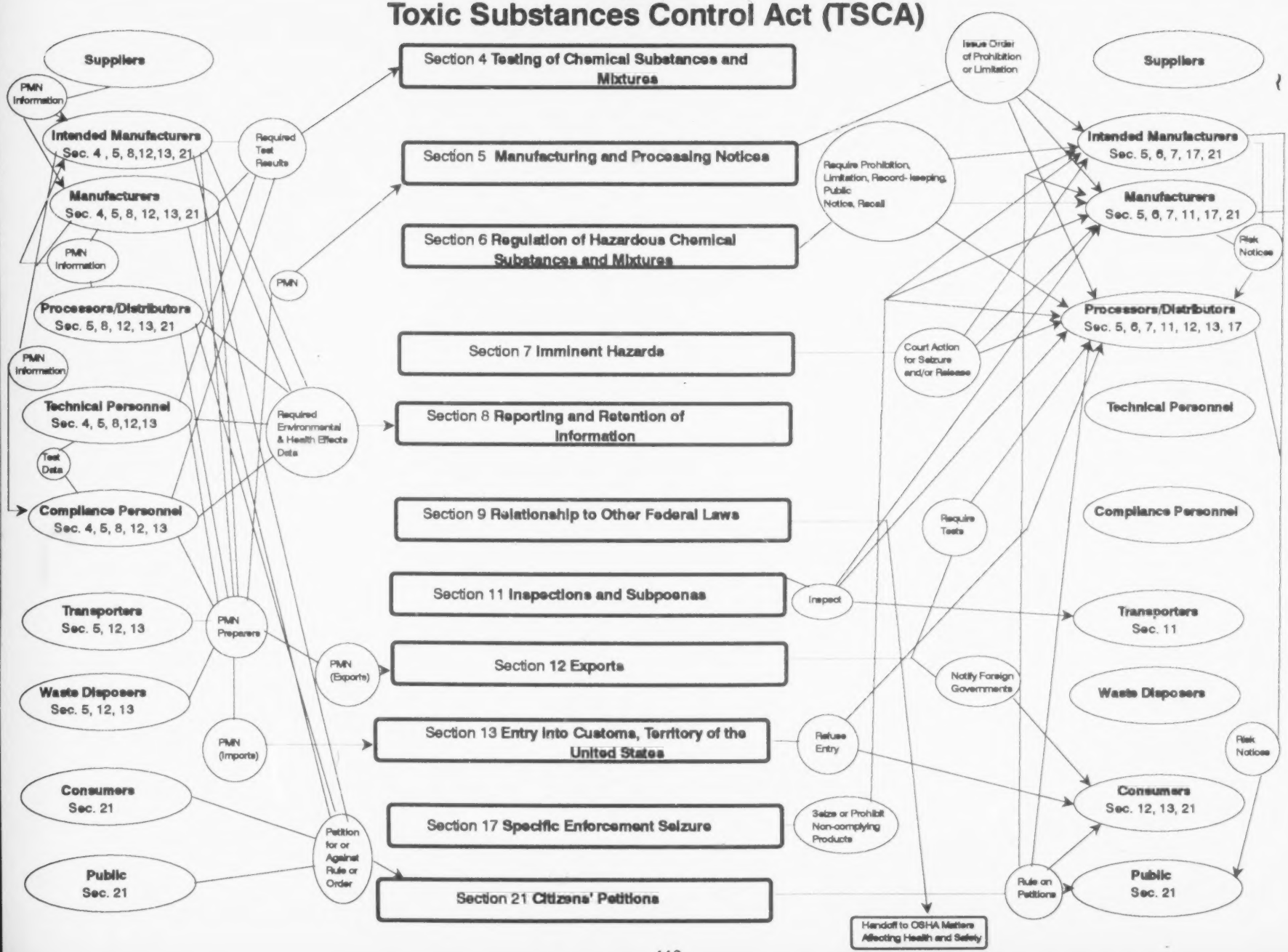
Initially, much of the costs of federal and state regulation falls on individual businesses, that must implement the regulations. And much of these costs falls on manufacturing firms that must face international competition. In the end, however, the costs to businesses of government regulation are inevitably passed on to individual members of the economy in several ways: higher prices to consumers; lower wages to employees; lower profits that translate to less taxes paid to government, and lower dividends to stockholders. In turn, lower profits restrain new capital investment and hold down the productivity gains that are essential to improved U.S. international competitiveness and rising U.S. living standards. Thus, everyone in the economy has a stake in the amount and efficiency of government regulations.

Estimates of overall costs are difficult because regulation effects the economy in so many ways, including, for example, its potential impact on technological advance, innovation, and economic growth rates. But the effects of regulation on the economy are becoming more apparent and are receiving increased attention. Some work has been done which attempts to quantify the effects of regulation on economic growth rates.

In one comprehensive assessment, The Cost of Federal Regulation, by Thomas D. Hopkins at the Rochester Institute of Technology, the costs of regulation are characterized in three categories: compliance expenditures (what firms must spend to bring their operations into conformance with new regulation), productivity costs (the toll on innovation and cost control as a result of mandated expenditures) and consumer welfare reduction (higher consumer prices and limitations placed on consumer choices.) According to this assessment, in 1992 regulatory costs per household were $5,831, more than half as much as federal tax receipts of $11,255 that year on a per household basis.

Figure C

Toxic Substances Control Act (TSCA)


Suppliers
PMN Information
Intended Manufacturers Sec. 4 , 5, 8,12,13, 21
Manufacturers Sec. 4, 5, 8, 12, 13, 21
PMN Information
Processors/Distributors Sec. 5, 8, 12, 13, 21
PMN Information
Technical Personnel Sec. 4, 5, 8,12,13
Test Data
Compliance Personnel Sec. 4, 5, 8, 12, 13
Transporters Sec. 5, 12, 13
Waste Disposers Sec. 5, 12, 13
Consumers Sec. 21
Public Sec. 21
Required Test Results
PMN
Required Environmental & Health Effects Data
PMN Preparers
PMN (Exports)
PMN (Imports)
Petition for or Against Rule or Order
Section 4 Testing of Chemical Substances and Mixtures
Section 5 Manufacturing and Processing Notices
Section 6 Regulation of Hazardous Chemical Substances and Mixtures
Section 7 Imminent Hazards
Section 8 Reporting and Retention of Information
Section 9 Relationship to Other Federal Laws
Section 11 Inspections and Subpoenas
Section 12 Exports
Section 13 Entry into Customs, Territory of the United States
Section 17 Specific Enforcement Seizure
Section 21 Citizens' Petitions
Issue Order of Prohibition or Limitation
Require Prohibition, Limitation, Record- keeping, Public Notice, Recall
Court Action for Seizure and/or Release
Require Tests
Inspect
Notify Foreign Governments
Refuse Entry
Seize or Prohibit Non-complying Products
Rule on Petitions
Handoff to OSHA Matters Affecting Health and Safety
Suppliers
Intended Manufacturers Sec. 5, 6, 7, 17, 21
Manufacturers Sec. 5, 6, 7, 11, 17, 21
Risk Notices
Processors/Distributors Sec. 5, 6, 7, 11, 12, 13, 17
Technical Personnel
Compliance Personnel
Transporters Sec. 11
Waste Disposers
Risk Notices
Consumers Sec. 12, 13, 21
Public Sec. 21

Implementation of the Toxic Substances Control Act (TSCA)

The diagram on the facing page shows key sections of one of the important regulatory laws -- the Toxic Substances Control Act (TSCA) -- and illustrates the maze of requirements and interrelationships this one Act creates among regulators, manufacturers, and other businesses.

The Toxic Substances Control Act (TSCA), passed in 1976, provides EPA with the authority to regulate toxic substances. Unlike other environmental statutes, TSCA is product-focussed, and therefore multi-media. It provides EPA with the authority to:

- ❑ regulate new and existing chemical substances
- ❑ gather chemical exposure and toxicological information
- ❑ require testing, and
- ❑ regulate unreasonable risk.

TSCA also provides EPA with authority to regulate new uses and impose restrictions on use including—in the most severe case—banning of the substance. TSCA looks at chemicals as either existing (listed on the TSCA inventory) or new (introduced since the last inventory update).

The diagram shows 11 key sections of the law. A few examples of the many time-consuming and regulatory procedures imposed by some of the sections of TSCA noted below for illustrative purposes are:

❑ Test rules (Section 4) may require manufacturers of existing chemicals to perform extremely expensive toxicological tests. Costs have ranges from $3,000 to $1.2 million per test, depending on the complexity of the test. Also, test rules may require a number of tests to be conducted on an individual chemical and the total cost per chemical can be as high as $5 million. Toxicity testing requirements are often more extensive than is warranted for a chemical's exposure potential is based on its physical/chemical characteristics, production process, or use patterns.

❑ Submission of premanufacturing notice (PMN, Section 5 of the law) forms is required for approval of all new chemicals. Following a PMN review, EPA may take the following actions: deny approval (bar entry into the market); approve; or approve, but require additional data, or restrict uses and markets. PMNs approved with restrictions often take over a year to be processed. In worst cases, it can take up to four years to obtain approval.

❑ Reporting and Retention of Information (Section 8(e)) requires companies to inform EPA immediately of any information which reasonably supports the conclusion that a particular chemical substance presents a substantial risk of injury to health or the environment. EPA's guidance for Section 8(e) reporting has, however, been unclear and has evolved over time. As a result of the confusion over reporting requirements and to encourage disclosure of previously unsubmitted information, EPA established the Compliance Audit Program (CAP). Under the CAP, on a one-time basis, studies that fall under the reporting requirements of Section 8(e) but were not previously submitted to EPA, can be submitted late with assessment of a maximum penalty of $1 million per company. However, the actual cost of the program for some participants is several millions of dollars due to the costs of conducting the extensive CAP file audit. More than 120 companies have registered for the CAP.

❑ Exports (Section 12). Companies must file export notices with EPA for materials regulated under TSCA every year for every country the chemical is shipped to. This requirement applies even to chemicals present only as known trace amounts of by-products or R&D samples.

❑ Penalties imposed under TSCA regulations do not allow for administrative errors. In spite of the extensive recording-keeping required by TSCA, a simple clerical error may be subject to the same severe $17,000 per day penalty as a more serious violation.

THE FEDERAL REGULATORY BURDEN.....

Federal environmental, economic, social and other regulation pervades all aspects of American life and economic activity. Since the 1960s, Federal regulation has vastly increased. This can be best illustrated by looking at the Federal Register, which promulgates the various notices, laws, rules and regulations established by Congress and departments and agencies of the executive branch.

This sample page (No. 29860) from the Federal Register of May 24, 1993 promulgates an Environmental Protection Agency (EPA) interim final rule: "Land Disposal Restrictions for Ignitable and Corrosive Characteristic Wastes Whose Treatment Standards Were Vacated." In response to a U.S. Court of Appeals decision, it amends land treatment standards under the Clean Water Act (CWA) and well injection standards under the Safe Drinking Water Act (SDWA) for wastes which contain greater than 10 percent carbon by content (e.g. ignitable) and are corrosive. It establishes the interim final rule as effective on May 10, 1993 and allows comments until July 9, 1993.

This sample page is the first page of a 24 page "preamble", a summary section that provides an outline and supplementary information about the regulation.

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 264, 265, 268, 270, and 271

[FRL 4656–7]

Land Disposal Restrictions for Ignitable and Corrosive Characteristic Wastes Whose Treatment Standards Were Vacated

AGENCY: Environmental Protection Agency (EPA).

ACTION: Interim final rule.

SUMMARY: The Environmental Protection Agency (EPA) is today amending the treatment standards under the land disposal restrictions (LDR) program for wastes displaying the characteristic of ignitability (EPA Hazard Code D001) other than those ignitable wastes containing greater than 10 percent total organic carbon (i.e., D001 high TOC subcategory), and corrosivity (EPA Hazard Code D002) that are managed in systems other than those regulated under the Clean Water Act (CWA), those zero dischargers treating wastewater by CWA-equivalent treatment prior to ultimate land disposal, and those injecting into Class I deep wells regulated under the Safe Drinking Water Act (SDWA). This action is being taken to comply with the September 25, 1992 decision of the U.S. Court of Appeals in *Chemical Waste Management v. EPA*, 976 F.2d 2 (D.C. Cir. 1992). The underlying rule at issue in the opinion was signed on May 8, 1990, and published on June 1, 1990 (55 FR 22520). In the court's decision, the deactivation treatment standards for certain ignitable and corrosive wastes were vacated. Because land disposal of these wastes would be prohibited if no treatment standard is in place, EPA is replacing the vacated treatment standard before the court's mandate becomes effective to avoid an absolute ban on land disposal of these wastes.

DATES: This interim final rule is effective on May 10, 1993.

Comments may be submitted on or before July 9, 1993.

ADDRESSES: The public must send an original and two copies of their written comments to the EPA RCRA Docket (OS–305), U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460. Place the Docket Number F–93–TTCF–FFFFF on your comments. The official record for this rulemaking is also located in the RCRA Docket, room 2427, at the above address. It is open from 9 a.m. to 4 p.m., Monday through Friday, except on Federal holidays. The public must make an appointment to review docket materials by calling (202) 260–9327. A maximum of 100 pages from the docket may be copied at no cost. Additional copies cost $.15 per page.

FOR FURTHER INFORMATION CONTACT: For general information, contact the RCRA Hotline at (800) 424–9346 (toll free) or (703) 412–9810 locally. For information on specific aspects of this rule, contact Rhonda Craig, and for technical information about treatment standards, contact Lisa Jones, Office of Solid Waste (OS–322W), U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460, telephone (703) 308–8434. For information on capacity determinations, contact Bengie Carroll, Office of Solid Waste (OS–321W), U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460, telephone (703) 308–8440.

SUPPLEMENTARY INFORMATION:

Outline

I. Background
A. Summary of the Hazardous and Solid Waste Amendments of 1984
B. Summary of Third Third Standards for Ignitable, Corrosive and Reactive Characteristic Wastes
C. Summary of the D.C. Circuit's Opinion
D. Response to the Court Decision
1. Options Prepared for the Notice of Data Availability
2. Solicitation of Comments on the Supplemental Information Report
E. Rules Compelled by the Opinion to be Issued on An Emergency Basis
1. Zero Discharge Facilities
2. Underground Injection Wells Other than Class I
F. Identification of Affected Facilities
1. Underground Injection Wells
2. Combustion and Stabilization
G. Future Response to Issues Remanded by the Court Decision
II. Overview of the Interim Final Rule
III. Treatment Standards for Ignitable and Corrosive Wastes
A. Overview of Treatment Standards for Ignitable and Corrosive Wastes Not Disposed In CWA or SDWA Facilities or That Do Not Engage in CWA-Equivalent Treatment Prior to Land Disposal
B. The Basis of the Numerical Treatment Standards
C. Alternative Standards for Ignitable Wastes
D. Alternatives Discussed in the Supplemental Information Report
E. Changes in Treatability Group Are Not a New Point of Generation for Purposes of Today's Rule
F. Minimize Threat Levels
G. Compliance Monitoring Requirements
H. Addressing Potential VOC Emissions and Violent Reactions During Dilution of Ignitable and Reactive Wastes
1. Potential VOC Emissions During Dilution of Ignitable Wastes—Background and Comments
2. Potential Violent Reactions During Dilution of Reactive Wastes—Background and Comments
3. Final Approach
I. Notification Requirements
1. Constituents To Be Included on the LDR Notification
2. Management in Subtitle C-Regulated Facilities
3. Management of Deactivated Ignitable or Corrosive Wastes at a Subtitle D Waste Management Facility
J. De Minimis Losses of Characteristic Materials Are Not Prohibited
1. De Minimis Losses of Ignitable (D001), or Corrosive (D002) Commercial Chemical Products or Chemical Intermediates Containing Underlying Hazardous Constituents
2. Wastewaters From Laboratory Operations
K. Status of Impoundments and Landfills Receiving Decharacterized Ignitable and Corrosive Wastes Subject to a Capacity Variance
IV. Capacity Determinations
A. Data Sources and Limitations
B. Comments on Capacity from the Notice of Data Availability
C. Methodology and Analysis
1. Treatment and Treatment Residuals
2. IC Wastes Currently Deactivated Covered By This Rule
3. Affected Facilities
D. Variance Determinations
V. State Authority
A. Applicability of Rules in Authorized States
B. Effect on State Authorization
VI. Regulatory Requirements
A. Economic Impact Screening Analysis Pursuant to Executive Order 12291
1. Methodology
a. Estimation of Affected Volumes—Overview
b. Estimation of Affected Volumes—Liquids
c. Estimation of Affected Volumes—Residuals
d. Estimation of Affected Volumes—Affected Class V Wells
e. Estimation of Costs Incurred—Liquids, Residuals and Affected Class V Wells
f. Estimation of Costs Incurred—Testing Costs
g. Estimation of Costs Incurred—Reporting Requirements
h. Methodology for Economic Impact Analysis
2. Results
a. Results of Affected Volumes Estimation
b. Results of Incremental Costs Incurred
c. Results of the Economic Impacts Analysis
d. Sensitivity Analysis of Cost Results
B. Regulatory Flexibility Analysis
C. Paperwork Reduction Act
VII. Interim Final Rule Justification

I. Background

A. Summary of the Hazardous and Solid Waste Amendments of 1984

The Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA),

29884 Federal Register / Vol. 58, No. 98 / Monday, May 24, 1993 / Rules and Regulations

PART 264—STANDARDS FOR OWNER AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

1. The authority citation for part 264 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6924, and 6925.

2. Section 264.1, paragraph (g)(6) is revised to read as follows:

§ 264.1 Purpose, scope and applicability.

* * * * * * *

(g) * * *

(6) The owner or operator of an elementary neutralization unit or a wastewater treatment unit as defined in § 260.10 of this chapter, provided that if the owner or operator is diluting hazardous ignitable (D001) wastes (other than the D001 High TOC Subcategory defined in § 268.42, Table 2, of this chapter), or corrosive (D002) waste, to remove the characteristic before land disposal, the owner/operator must comply with the requirements set out in § 264.17(b) of this part.

* * * * *

PART 265—INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

3. The authority citation for part 265 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6924 and 6925.

4. Section 265.1, paragraph (c)(10) is revised to read as follows:

§ 265.1 Purpose, scope and applicability.

* * * * * * *

(c) * * * –

(10) The owner or operator of an elementary neutralization unit or a wastewater treatment unit as defined in § 260.10 of this chapter, provided that if the owner or operator is diluting hazardous ignitable (D001) wastes (other than the D001 High TOC Subcategory defined in § 268.42, Table 2, of this chapter), or corrosive (D002) waste, in order to remove the characteristic before land disposal, the owner/operator must comply with the requirements set out in § 265.17(b).

* * * * * *

PART 268—LAND DISPOSAL RESTRICTIONS

5. The authority citation for part 268 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6921, and 6924.

6. In § 268.1, paragraphs (e) (4) and (5) are added to read as follows:

§ 268.1 Purpose, scope /and applicability.

* * * * * *

(e) * * *

(4) *De minimis* losses to wastewater treatment systems of commercial chemical product or chemical intermediates that are ignitable (D001), or corrosive (D002), and that contain underlying hazardous constituents as defined in § 268.2 of this part, are not considered to be prohibited wastes. *De minimis* is defined as losses from normal material handling operations (e.g. spills from the unloading or transfer of materials from bins or other containers, leaks from pipes, valves or other devices used to transfer materials); minor leaks of process equipment, storage tanks or containers; leaks from well-maintained pump packings and seals; sample purgings; and relief device discharges.

(5) Land disposal prohibitions do not apply to laboratory wastes displaying the characteristic of ignitability (D001) or corrosivity (D002), that are commingled with other plant wastewaters under designated circumstances: ignitable and corrosive laboratory wastes containing underlying hazardous constituents from laboratory operations, that are mixed with other plant wastewaters at facilities whose ultimate discharge is subject to regulation under the CWA (including wastewaters at facilities which have eliminated the discharge of wastewater), provided that the annualized flow of laboratory wastewater into the facility's headwork does not exceed one percent, or provided that the laboratory wastes' combined annualized average concentration does not exceed one part per million in the facility's headwork.

7. In § 268.2, paragraph (i) is added to read as follows:

§ 268.2 Definitions applicable in this part.

* * * * * *

(i) *Underlying hazardous constituent* means any regulated constituent present at levels above the F039 constituent-specific treatment standard at the point of generation of the hazardous waste.

8. In § 268.7, the introductory text of paragraph (a), and paragraphs (a)(1)(ii) and (b)(4)(ii) are revised to read as follows:

§ 268.7 Waste analysis and recordkeeping.

(a) Except as specified in § 268.32 if a generator's waste is listed in 40 CFR part 261, subpart D, the generator must test his waste, or test an extract using the test method described in part 261, appendix II of this chapter, or use knowledge of the waste, to determine if the waste is restricted from land disposal under this part. Except as specified in § 268.32, if a generator's waste exhibits one or more of the characteristics set out at 40 CFR part 261, subpart C of this chapter, the generator must test an extract using the test method described in appendix IX of this part, or use knowledge of the waste, to determine if the waste is restricted from land disposal under this part. If the generator determines that his waste displays the characteristic of ignitability (D001) (and is not in the High TOC Ignitable Liquids Subcategory or is not treated by INCIN, FSUBS, or RORGS of § 268.42, Table 1), or the characteristic of corrosivity (D002), and is prohibited under § 268.37, the generator must determine what underlying hazardous constituents (as defined in § 268.2 of this part), are reasonably expected to be present in the D001 or D002 waste.

(1) * * *

(ii) The corresponding treatment standards for wastes F001–F005, F039, wastes prohibited pursuant to § 268.32 or RCRA section 3004(d), and for underlying hazardous constituents (as defined in § 268.2 of this part), in D001 and D002 wastes if those wastes are prohibited under § 268.37 of this part. Treatment standards for all other restricted wastes must either be included, or be referenced by including on the notification the applicable wastewater (as defined in § 268.2(f)) or nonwastewater (as defined in § 268.2(d)) category, the applicable subdivisions made within a waste code based on waste-specific criteria (such as D003 reactive cyanides), and the CFR section(s) and paragraph(s) where the applicable treatment standard appears. Where the applicable treatment standards are expressed as specified technologies in § 268.42, the applicable five-letter treatment code found in, Table 1 of § 268.42 (e.g., INCIN, WETOX) also must be listed on the notification.

* * * * *

(b) * * *

(4) * * *

(ii) The corresponding treatment standards for wastes F001–F005, F039, wastes prohibited pursuant to § 268.32 or RCRA section 3004(d), and for underlying hazardous constituents (as defined in § 268.2 of this part), in D001 and D002 wastes if those wastes are prohibited under § 268.37 of this part. Treatment standards for all other restricted wastes must either be included, or be referenced by including on the notification the applicable wastewater (as defined in § 268.2(f)) or nonwastewater (as defined in § 268.2(d))

THE FEDERAL REGULATORY BURDEN.....

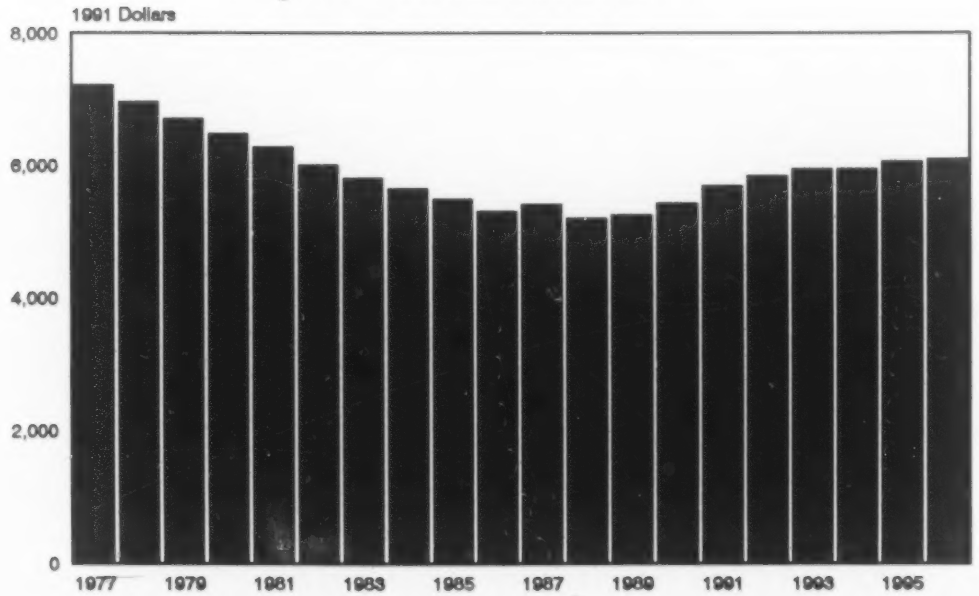
The sample page on the left presents some of the regulatory language dealing with standards concerning owners and operators of hazardous waste treatment, storage and disposal facilities along with certain land use restrictions. It is the first page of the regulation described by the preamble illustrated on the previous page.

The Federal Register is actually one large continuously augmented volume, documenting the manifold regulatory activities of the Federal government. It is paginated consecutively as the regulations or other information are entered into the Federal Register. This sample page from the Federal Register of May 24, 1993 is the 29,884th page in 1993. With seven months to go, the May 24 page count indicated it likely that the Federal Register of 1993 would top 70,000 pages in length, a new record.

The cost of environmental, social, economic, and other regulations has been estimated at nearly $6,000 per household. Despite efforts to reduce the regulatory burden, costs have been increasing since the mid-1980's and are projected to continue to increase into the mid-1990's.

Chart 7.1

Total Cost of Regulations per Household



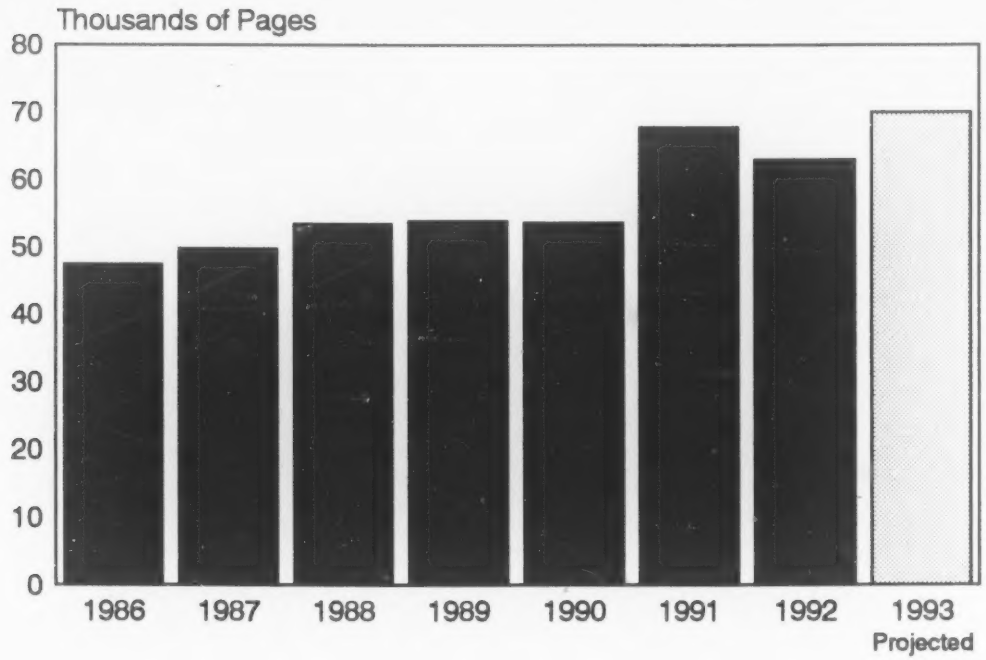
Source: Cost of Federal Regulation, Hopkins, Thomas D., Rochester Institute of Technology

BEST AVAILABLE COPY

During the 1980s, the federal regulatory burden expanded, as illustrated in the page count of the Federal Register. Despite efforts at reducing the federal paperwork burden, the number of regulations continues to advance:

Chart 7.2

Pages in the Federal Register



In recent years, significant progress has been made in improving the environment in the United States. Air pollution trends, as measured by emissions of 6 key air pollutants from all sources, illustrate this progress and the relatively small portion that stems from industrial sources:

Chart 7.3

Trends in Air Emissions

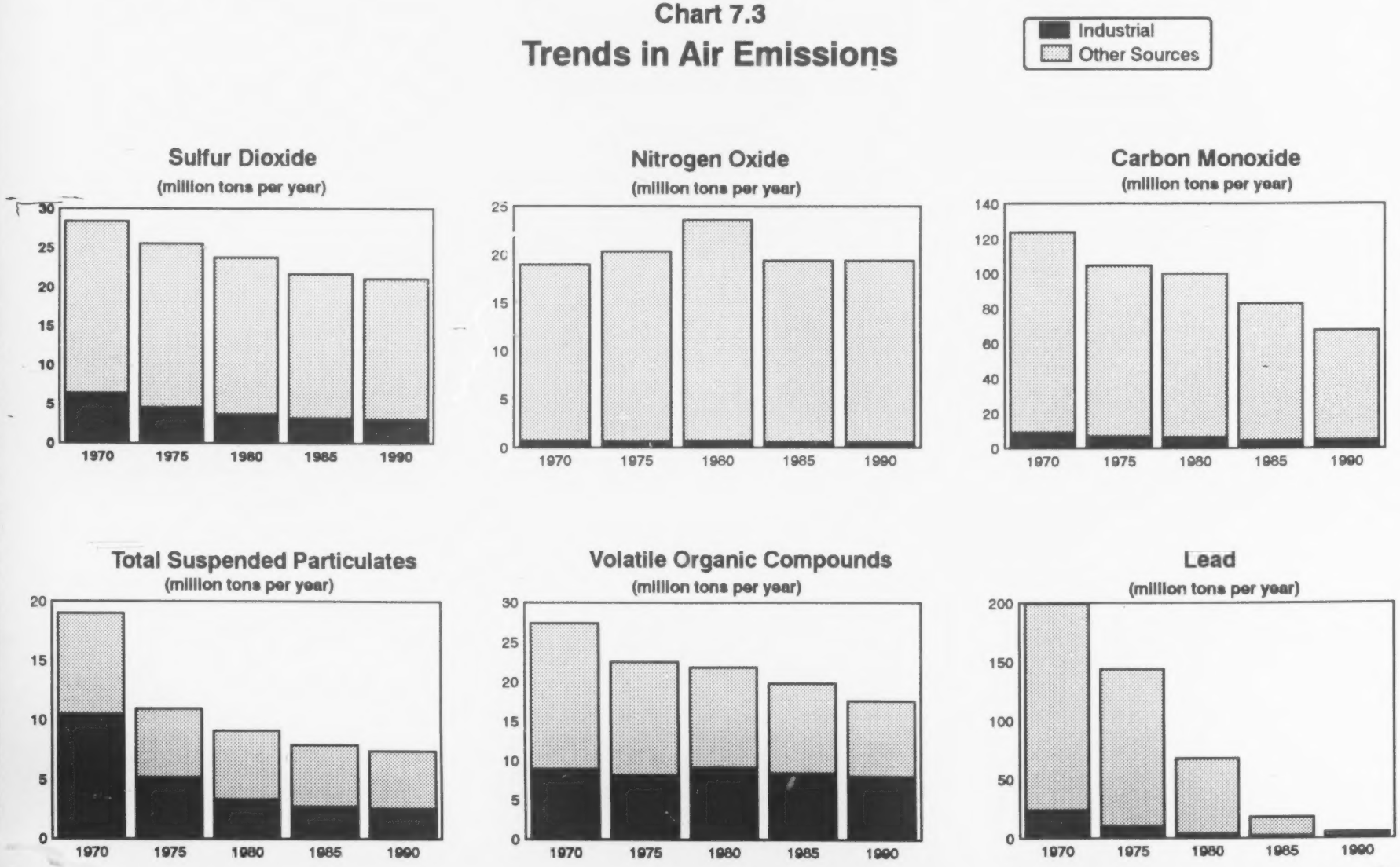


TABLE 7.1

KEY POLLUTION INDICATORS: A SUMMARY OF PROGRESS

(Millions of Metric Tons)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Sulfur Oxides													
Total Emissions	28.4	23.8	21.2	20.6	21.5	21.7	21.2	21.0	21.3	21.5	21.1	20.7	n/a
Industrial Processes	6.4	3.7	3.1	3.1	3.2	3.2	3.2	3.0	3.08	3.1	3.1	3.2	n/a
% of Total	22.6%	15.7%	14.5%	15.1%	14.9%	14.6%	14.9%	14.4%	14.5%	14.4%	14.5%	15.2%	n/a
Chemicals & Allied Products	0.5	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	n/a
% of Total	1.9%	1.1%	0.8%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.8%	0.9%	0.9%	n/a
Nitrogen Oxides													
Total Emissions	19.0	23.6	20.4	19.8	20.1	19.4	18.8	19.0	19.7	19.3	19.4	18.8	n/a
Industrial Processes	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	n/a
% of Total	3.7%	2.9%	2.7%	2.8%	2.9%	2.9%	3.0%	2.9%	3.0%	3.1%	3.0%	3.2%	n/a
Chemicals & Allied Products	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	n/a
% of Total	1.3%	0.8%	0.7%	0.7%	0.7%	0.7%	0.6%	0.7%	0.7%	0.7%	0.6%	0.7%	n/a
Volatile Organic Compounds													
Total Emissions	27.4	21.8	19.5	20.3	21.0	19.8	18.5	18.6	18.6	17.4	17.6	16.9	n/a
Industrial Processes	8.9	9.1	7.4	7.8	8.7	8.4	7.9	8.2	8.0	8.0	8.0	7.9	n/a
% of Total	32.6%	42.0%	38.0%	38.5%	41.4%	42.2%	42.9%	43.8%	43.0%	45.9%	45.6%	46.6%	n/a
Chemicals & Allied Products	1.6	1.8	1.6	1.8	2.0	1.8	1.7	1.8	1.9	1.9	1.9	1.9	n/a
% of Total	5.7%	8.3%	8.1%	8.8%	9.3%	9.0%	9.4%	9.6%	10.4%	11.0%	10.9%	11.4%	n/a
Carbon Monoxide													
Total Emissions	123.6	99.97	90.5	92.3	87.6	83.1	76.0	75.1	75.5	68.3	67.7	62.1	n/a
Industrial Processes	8.95	6.34	4.4	4.3	4.7	4.4	4.2	4.3	4.6	4.6	4.6	4.7	n/a
% of Total	7.2%	6.3%	4.8%	4.7%	5.3%	5.3%	5.5%	5.8%	6.1%	6.7%	6.8%	7.6%	n/a
Chemicals & Allied Products	3.1	1.95	1.5	1.7	1.9	1.8	1.7	1.7	1.8	1.8	1.9	1.8	n/a
% of Total	2.5%	2.0%	1.7%	1.8%	2.2%	2.2%	2.3%	2.3%	2.4%	2.7%	2.8%	2.9%	n/a
Particulates													
Total Emissions	19.0	9.1	7.7	7.8	8.1	7.9	7.3	7.4	7.9	7.6	7.4	7.4	n/a
Industrial Processes	10.5	3.3	2.6	2.4	2.8	2.7	2.4	2.4	2.5	2.5	2.5	2.6	n/a
% of Total	55.5%	36.5%	33.5%	30.8%	34.7%	34.4%	33.2%	32.1%	31.2%	32.5%	34.2%	34.4%	n/a
Chemicals & Allied Products	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	n/a
% of Total	1.2%	1.5%	1.3%	1.4%	1.6%	1.5%	1.2%	1.3%	1.3%	1.3%	1.4%	1.5%	n/a
Lead *													
Total Emissions	199.1	68.0	52.3	44.7	38.3	18.3	6.6	6.2	5.9	5.5	5.1	5.0	n/a
Industrial Processes	23.9	3.6	2.7	2.4	2.3	2.3	1.9	1.9	2.0	2.2	2.2	2.2	n/a
% of Total	12.0%	5.3%	5.2%	5.5%	6.0%	12.6%	29.2%	31.2%	34.5%	40.3%	43.5%	44.5%	n/a

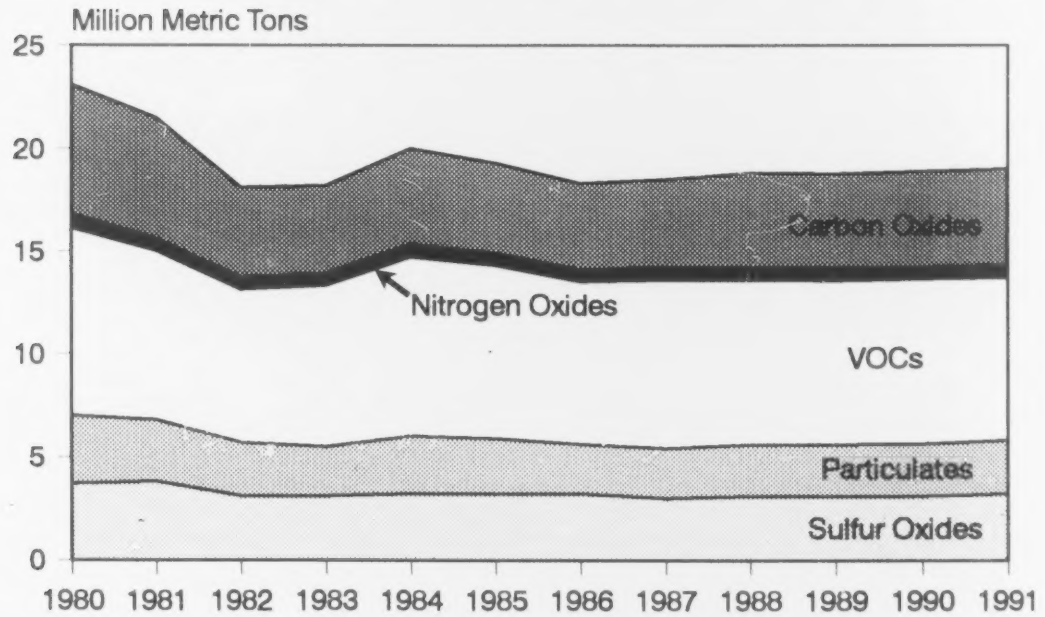
Source: Environmental Protection Agency

* All data are in millions of metric tons, except lead emissions, which are in thousands of metric tons.

Contrary to popular opinion, pollution levels in most industrial sectors have fallen -- even though U.S. industrial output has grown 36 percent since 1980.

Chart 7.4

Trends in Industrial Emissions



BEST AVAILABLE COPY

Also contrary to popular opinion, industry is not the major source of emissions. For example, industrial processes contributed only 15 percent of 1991 sulfur dioxide emissions; chemicals 1 percent of the total:

Chart 7.5

U.S. Emissions of Sulfur Oxides By Source

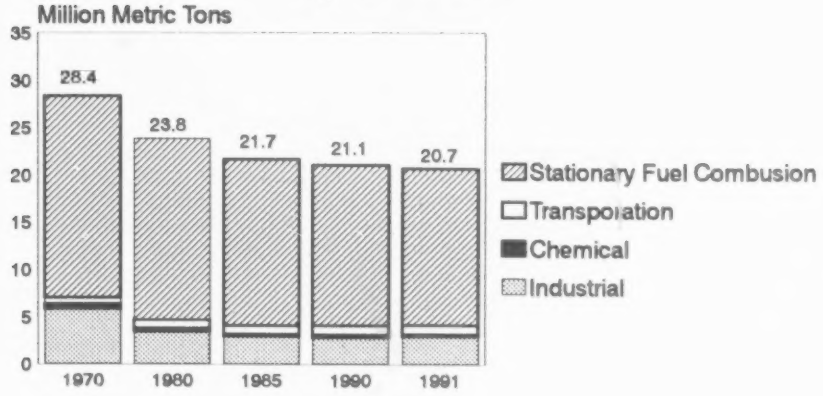


Chart 7.6

Sulfur Oxides By Source, 1991

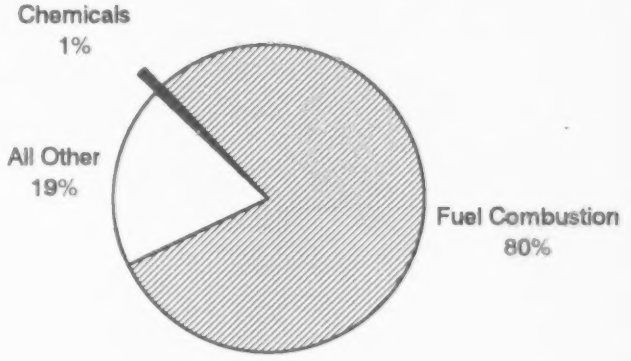


TABLE 7.2

U.S. EMISSIONS OF SULFUR OXIDES, BY SOURCE

(Million Metric Tons)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total Sulfur Oxide Emissions	28.4	23.8	21.2	20.6	21.5	21.7	21.2	21.0	21.3	21.5	21.1	20.7	n/a
Transportation	0.6	0.9	0.8	0.8	0.8	0.9	0.9	0.9	0.9	1.0	1.0	1.0	n/a
Stationary Fuel Combustion	21.3	19.1	17.3	16.7	17.4	17.6	17.1	17.0	17.3	17.4	17.0	16.6	n/a
Industrial Processes	6.4	3.7	3.1	3.1	3.2	3.2	3.2	3.0	3.1	3.1	3.1	3.2	n/a
Chemicals & Allied Products	0.5	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	n/a
Other Industrial	5.9	3.5	2.9	2.9	3.0	3.0	3.0	2.8	2.9	2.9	2.9	3.0	n/a
Solid Waste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n/a
Chemicals as a % of Total Emissions	1.9%	1.1%	0.8%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.8%	0.9%	0.9%	n/a

Source: Environmental Protection Agency

Transportation and fuel combustion contributed 96 percent of 1991 nitrogen oxide emissions; 1 percent came from the chemical industry:

Chart 7.7

U.S. Emissions of Nitrogen Oxides By Source

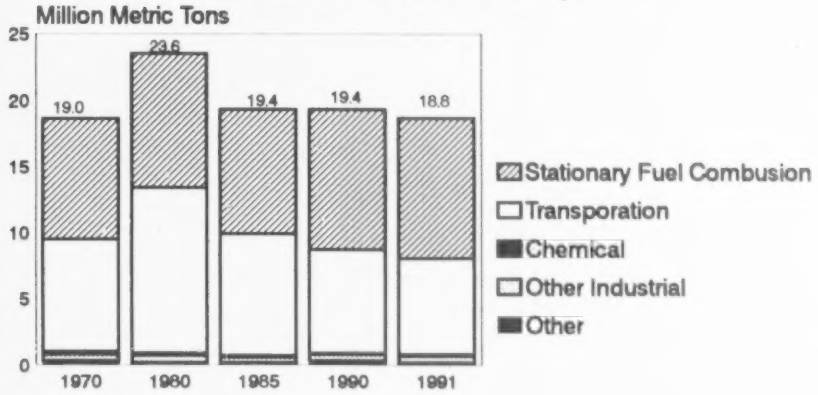


Chart 7.8

Nitrogen Oxides Emissions By Source, 1991

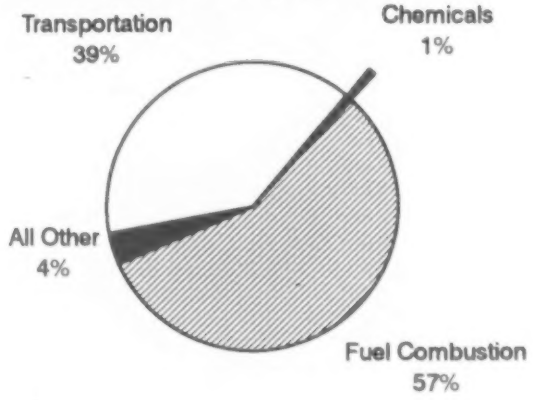


TABLE 7.3

U.S. EMISSIONS OF NITROGEN OXIDES, BY SOURCE

(Million Metric Tons)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total Nitrogen Oxide Emissions	19.0	23.6	20.4	19.8	20.1	19.4	18.8	19.0	19.7	19.3	19.4	18.8	n/a
Transportation	8.5	12.5	9.7	9.4	9.1	9.2	8.5	8.1	8.2	7.9	7.8	7.3	n/a
Stationary Fuel Combustion	9.1	10.1	9.8	9.6	10.2	9.4	9.6	10.1	10.5	10.6	10.6	10.6	n/a
Industrial Processes:	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	n/a
Chemicals & Allied Products	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	n/a
Other Industrial	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	n/a
Solid Waste	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	n/a
Miscellaneous	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.2	n/a
Chemicals as a % of Total Emissions	1.3%	0.8%	0.7%	0.7%	0.7%	0.7%	0.6%	0.7%	0.7%	0.7%	0.6%	0.7%	n/a

Source: Environmental Protection Agency

Industry was the source of 47 percent of VOC emissions in 1991; the chemical industry generated 11% of the total:

Chart 7.9

U.S. Emissions of Volatile Organic Compounds By Source

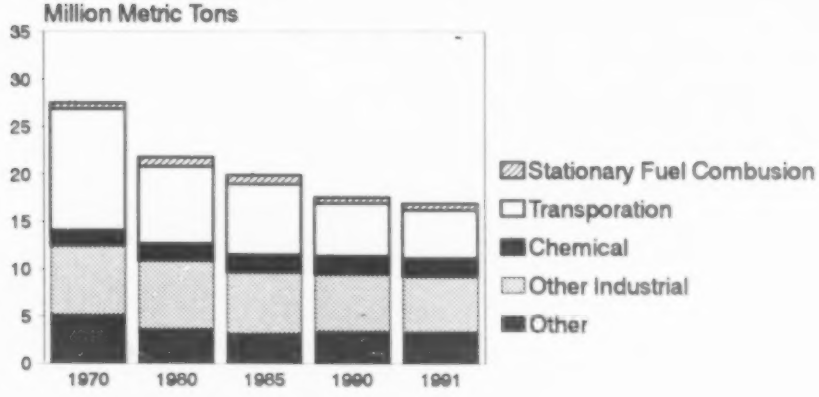


Chart 7.10

Volatile Organic Compounds By Source, 1991

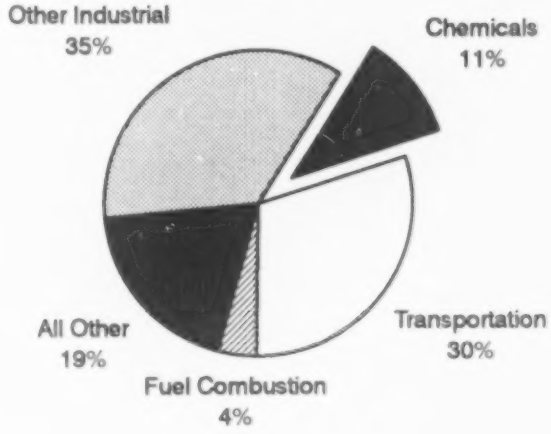


TABLE 7.4

U.S. EMISSIONS OF VOLATILE ORGANIC COMPOUNDS (VOCs), BY SOURCE
(Million Metric Tons)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total VOC Emissions	27.4	21.8	19.5	20.3	21.0	19.8	18.5	18.6	18.6	17.4	17.6	16.9	n/a
Transportation	12.8	8.1	8.3	8.2	8.1	7.5	6.9	6.6	6.3	5.5	5.5	5.1	n/a
Stationary Fuel Combustion	0.6	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.6	0.7	n/a
Industrial Processes	8.9	9.1	7.4	7.8	8.7	8.4	7.9	8.2	8.0	8.0	8.0	7.9	n/a
Chemicals & Allied Products	1.6	1.8	1.6	1.8	2.0	1.8	1.7	1.8	1.9	1.9	1.9	1.9	n/a
Other Industrial	7.4	7.3	5.8	6.0	6.7	6.6	6.2	6.4	6.1	6.1	6.1	5.9	n/a
Solid Waste	1.8	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	n/a
Miscellaneous	3.3	2.9	2.1	2.7	2.6	2.5	2.2	2.4	2.9	2.4	2.8	2.6	n/a
Chemicals as a % of Total Emissions	5.7%	8.3%	8.1%	8.8%	9.3%	9.0%	9.4%	9.6%	10.4%	11.0%	10.9%	11.4%	n/a

Source: Environmental Protection Agency

Transportation and fuel combustion contributed 78 percent of 1991 carbon monoxide emissions. Only 3 percent came from the chemical industry:

Chart 7.11

U.S. Carbon Monoxide Emissions By Source

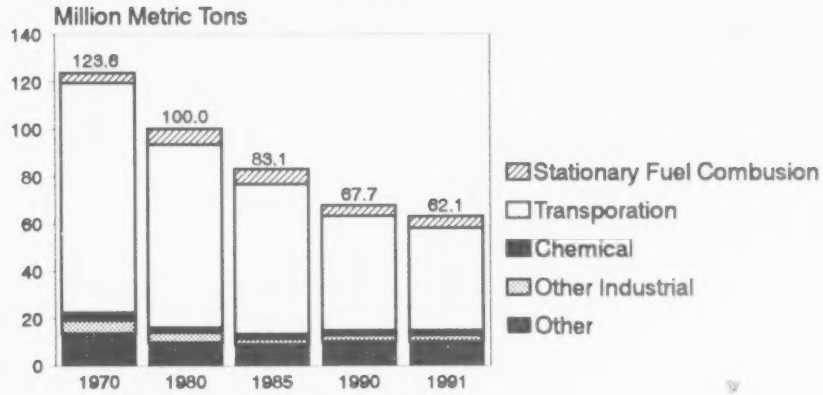


Chart 7.12

Carbon Monoxide Emissions By Source, 1991

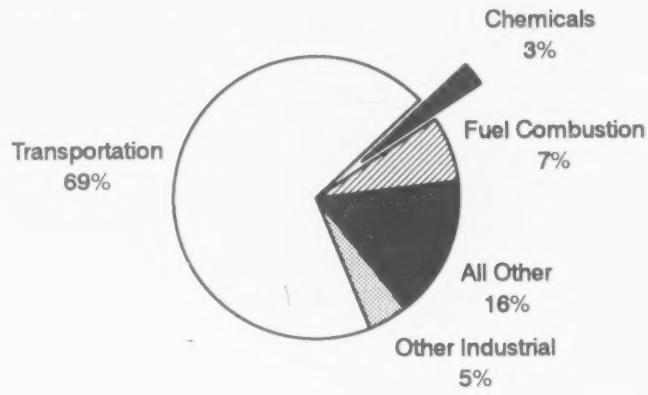


TABLE 7.5

U.S. EMISSIONS OF CARBON MONOXIDE, BY SOURCE

(Million Metric Tons)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total Carbon Monoxide Emissions	123.6	100.0	90.5	92.3	87.6	83.1	76.0	75.1	75.5	68.3	67.7	62.1	n/a
Transportation	96.9	77.4	72.3	71.4	67.7	63.5	58.7	56.2	53.5	49.3	48.5	43.5	n/a
Stationary Fuel Combustion	4.2	6.6	7.1	7.0	7.1	6.3	6.3	6.3	6.3	6.4	4.3	4.7	n/a
Industrial Processes	9.0	6.3	4.4	4.3	4.7	4.4	4.2	4.3	4.6	4.6	4.6	4.7	n/a
Chemicals & Allied Products	3.1	2.0	1.5	1.7	1.9	1.8	1.7	1.7	1.8	1.8	1.9	1.8	n/a
Other Industrial	5.9	4.4	2.8	2.7	2.8	2.6	2.5	2.6	2.8	2.8	2.8	2.9	n/a
Solid Waste	6.4	2.1	1.9	1.8	1.8	1.9	1.7	1.7	1.7	1.7	1.7	2.1	n/a
Miscellaneous	7.2	7.6	4.9	7.8	6.4	7.1	5.2	6.4	9.5	6.3	8.6	7.2	n/a
Chemicals as a % of Total Emissions	2.5%	2.0%	1.7%	1.8%	2.2%	2.2%	2.3%	2.3%	2.4%	2.7%	2.8%	2.9%	n/a

Source: Environmental Protection Agency

Transportation and fuel combustion contributed 47 percent of 1991 particulate emissions. All of industry contributed 34 percent, while only 1 percent came from the chemical industry:

Chart 7.13

U.S. Emissions of Particulates By Source

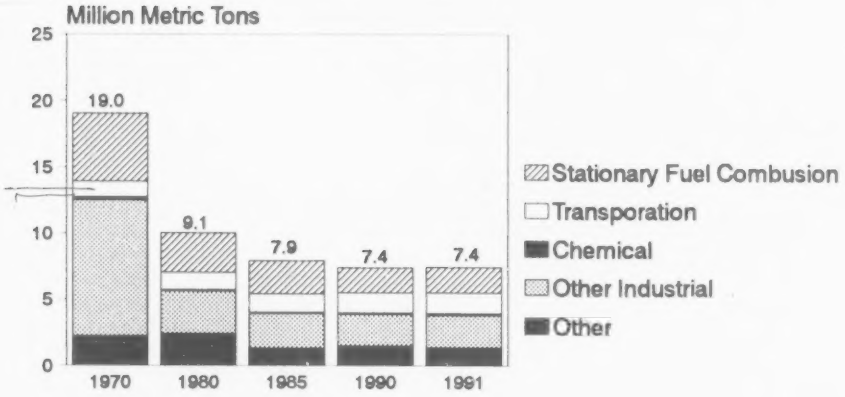


Chart 7.14

Particulates By Source, 1991

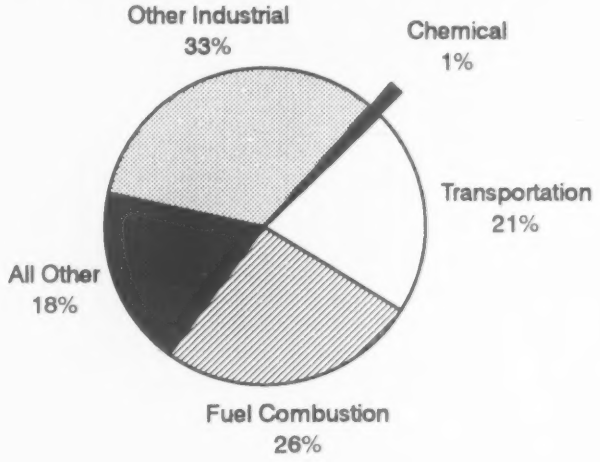


TABLE 7.6

U.S. EMISSIONS OF PARTICULATES, BY SOURCE

(Million Metric Tons)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total Particulate Emissions	19.0	9.1	7.7	7.8	8.1	7.9	7.3	7.4	7.9	7.6	7.4	7.4	n/a
Transportation	1.2	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.5	1.5	1.5	1.6	n/a
Stationary Fuel Combustion	5.1	3.0	2.8	2.7	2.8	2.5	2.5	2.4	2.4	2.4	1.9	1.9	n/a
Industrial Processes:	10.5	3.3	2.6	2.4	2.8	2.7	2.4	2.4	2.5	2.5	2.5	2.6	n/a
Chemicals & Allied Products	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	n/a
Other Industrial	10.3	3.2	2.5	2.3	2.7	2.6	2.3	2.3	2.4	2.4	2.4	2.4	n/a
Solid Waste	1.1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	n/a
Miscellaneous	1.1	1.1	0.8	1.1	0.9	1.0	0.8	0.9	1.3	0.9	1.2	1.0	n/a
Chemicals as a % of Total Emissions	1.2%	1.5%	1.3%	1.4%	1.6%	1.5%	1.2%	1.3%	1.3%	1.3%	1.4%	1.5%	n/a

Source: Environmental Protection Agency

Lead emissions have dramatically declined to only 2.5 percent of the 1970 level. Fourty-four percent of the remaining lead emissions in 1991 came from industrial sources:

Chart 7.15

U.S. Emissions of Lead By Source

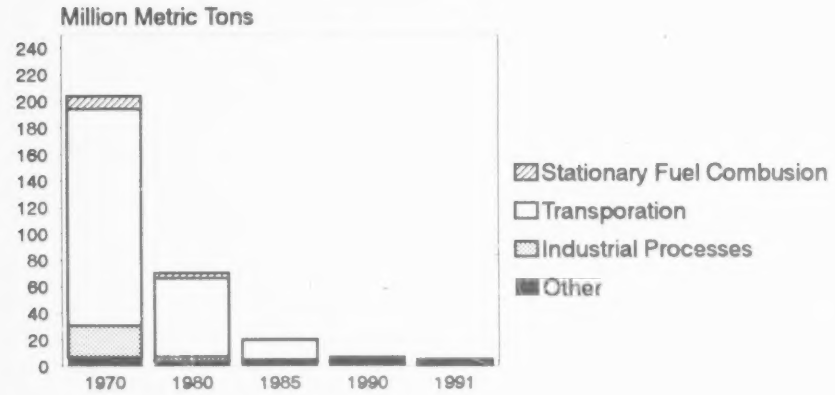


Chart 7.16

Lead Emissions By Source, 1991

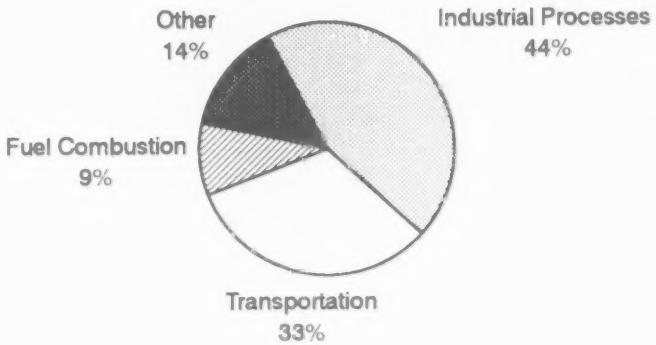


TABLE 7.7

U.S. EMISSIONS OF LEAD, BY SOURCE*
(Thousand Metric Tons)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total Lead Emissions	199.1	68.0	52.3	44.7	38.3	18.3	6.6	6.2	5.9	5.5	5.1	5.0	n/a
Transportation	163.6	59.4	47.0	40.8	34.7	14.7	3.5	3.0	2.6	2.2	1.7	1.6	n/a
Stationary Fuel Combustion	9.6	3.9	1.7	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	n/a
Industrial Processes	23.9	3.6	2.7	2.4	2.3	2.3	1.9	1.9	2.0	2.2	2.2	2.2	n/a
Solid Waste	6.7	3.7	3.1	2.7	2.7	2.6	2.6	2.6	2.5	2.3	2.2	0.7	n/a
Miscellaneous	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n/a

*The EPA does not list the chemical industry under this category.
Source: Environmental Protection Agency

Some other indicators of environmental improvement:

TABLE 7.8

CONTAMINANT LEVELS IN HERRING GULL EGGS - LAKE ERIE
(Parts per Million)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
DDE	n/a	2.98	3.07	2.39	3.23	2.83	2.77	1.77	2.07	2.69	2.01	2.12	n/a
Dieldrin	n/a	0.21	0.25	0.20	0.33	0.19	0.23	0.14	0.17	0.17	0.10	0.08	n/a
Mirex	n/a	0.18	0.13	0.17	0.22	0.14	0.14	0.12	0.10	0.18	0.11	0.07	n/a
HCB	n/a	0.09	0.08	0.05	0.06	0.06	0.06	0.03	0.05	0.05	0.03	0.02	n/a
PCBs	n/a	46.38	58.89	37.31	46.20	38.41	33.35	23.16	27.50	39.21	30.09	26.55	n/a

Source: Environment Canada

TABLE 7.9

FARM FERTILIZER USE

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Rates of Change 1980/70	1990/80	1991/90
Total Cropland Harvested(Million Acres)	293	352	362	306	348	342	325	302	298	318	322	319	n/a	1.9%	-0.9%	-0.9%
Pounds of Nutrient per Acre	110	131	118	118	125	127	121	126	132	123	128	127	n/a	1.8%	-0.3%	-0.5%
Primary Nutrient Consumption * (Million Tons)	16.1	23.1	21.4	18.1	21.8	21.7	19.7	19.1	19.6	19.6	20.6	20.3	20.9	3.7%	-1.1%	-1.4%

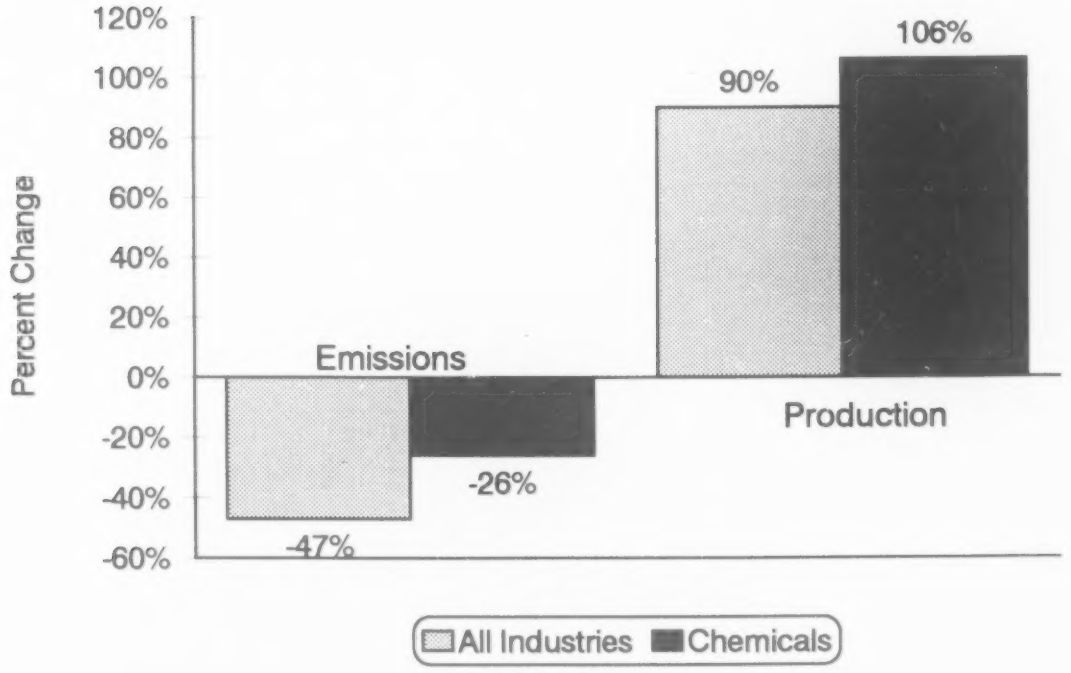
* Includes Nitrogen, Phosphorus, and Potash
Source: U.S. Department of Agriculture
The 1991 cropland total is a CMA estimate based on USDA data

To summarize, pollution as measured by emissions of 6 key pollutants has been declining, even while the nation's total output has been increasing:

Chart 7.17

Industrial Production and Emissions

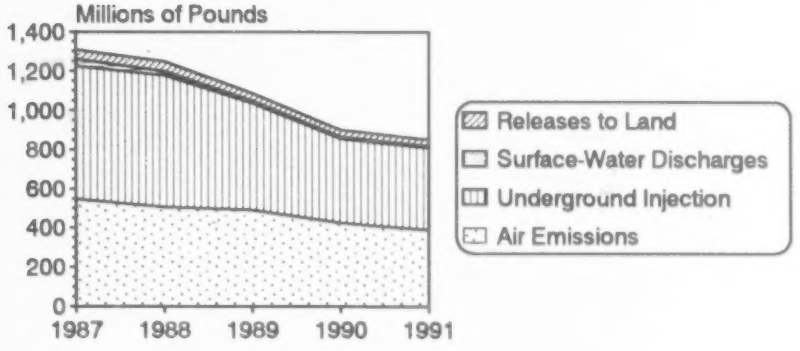
Changes 1970 to 1991



CMA member companies' "toxic" emissions -- as defined by EPA's Toxic-Release Inventory Reporting Program -- fell 35 percent between 1987 and 1991. Over the same period, production in the industry rose 11 percent.

Chart 7.18
Toxic-Release Inventory: (TRI)

Releases to the Environment



Transfers

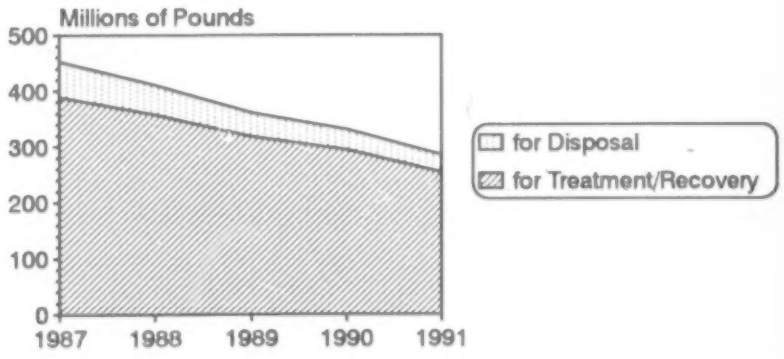


TABLE 7.10

TOXIC-RELEASE INVENTORY *

(Millions of Pounds)

	1987	1988	1989	1990	1991	Annualized Rates of Change 1991/87	Annualized Rates of Change 1991/90
Total Releases	1,307	1,249	1,085	899	848	-10.2%	-5.7%
Air Emissions	545.6	503.5	489.2	425.5	388.6	-8.1%	-8.7%
Surface-Water Discharges	35.8	18.9	11.6	9.7	8.4	-30.4%	-13.5%
Releases to Land	47.9	52.2	36.6	34.3	30.9	-10.4%	-9.9%
Underground Injection	677.5	674.2	547.7	429.7	420.4	-11.2%	-2.2%

	1987	1988	1989	1990	1991	Annualized Rates of Change 1991/87	Annualized Rates of Change 1991/90
Total Transfers	451	410	361	331	285	-10.8%	-13.7%
Transfers for Treatment/Recovery	388.9	358.1	318.0	294.7	253.5	-10.1%	-14.0%
Transfers for Disposal	62.6	52.0	42.8	36.0	31.9	-15.5%	-11.3%

*Includes core chemicals only: those which were on the TRI list during the entire period from 1987 to 1991

Source: CMA member companies

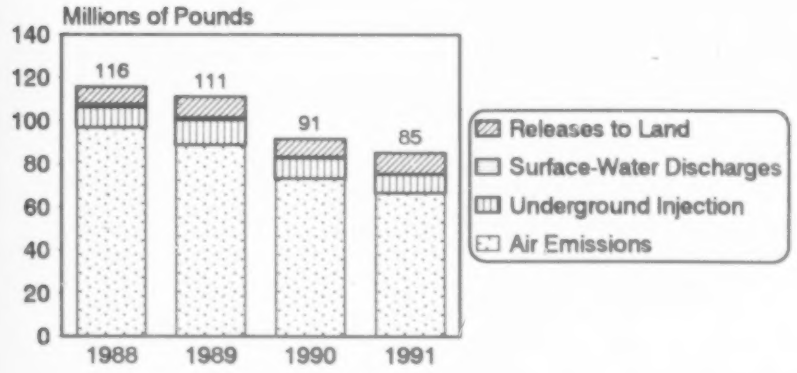
Releases of TRI chemicals to the environment have not been reduced simply by shipping a larger amount to treatment facilities: Transfers of these chemicals to treatment facilities fell 37 percent over 1987-1991.

EPA asked all U.S. manufacturers to voluntarily reduce emissions of 17 major chemicals by 33 percent from 1988 to 1992, and to reduce them by 50 percent by the end of 1995 -- these total reductions correspond to an average decrease of about 9.5 percent per year. As of 1991, CMA members have lowered their "33-50" emissions at an average annual rate of 9.8 percent:

Chart 7.19

"33-50" Emissions Reductions

Releases to the Environment



Transfers

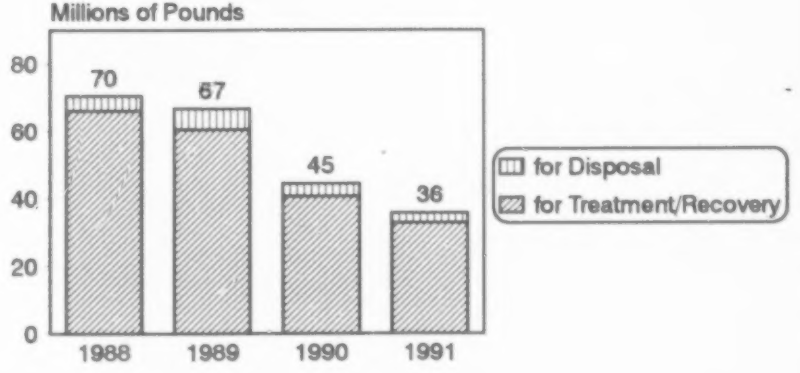


TABLE 7.11

EMISSIONS AND TRANSFERS OF "33-50" CHEMICALS
(Millions of Pounds)

	1988	1989	1990	1991	Annualized Rates of Change 1991/88	Annualized Rates of Change 1991/90
Total Releases	115.7	111.1	91.4	85.0	-9.8%	-7.0%
Air Emissions	96.86	88.95	73.24	66.48	-11.8%	-9.2%
Surface-Water Discharges	1.51	1.07	0.67	0.42	-35.0%	-38.3%
Releases to Land	8.01	9.79	8.18	9.57	6.1%	17.0%
Underground Injection	9.36	11.34	9.31	8.57	-2.9%	-8.0%

	1988	1989	1990	1991	Annualized Rates of Change 1991/88	Annualized Rates of Change 1991/90
Total Transfers	70.5	66.7	44.5	35.7	-20.3%	-19.9%
Transfers for Treatment/Recovery	66.01	60.59	40.76	32.75	-20.8%	-19.7%
Transfers for Disposal	4.46	6.12	3.76	2.92	-13.2%	-22.4%

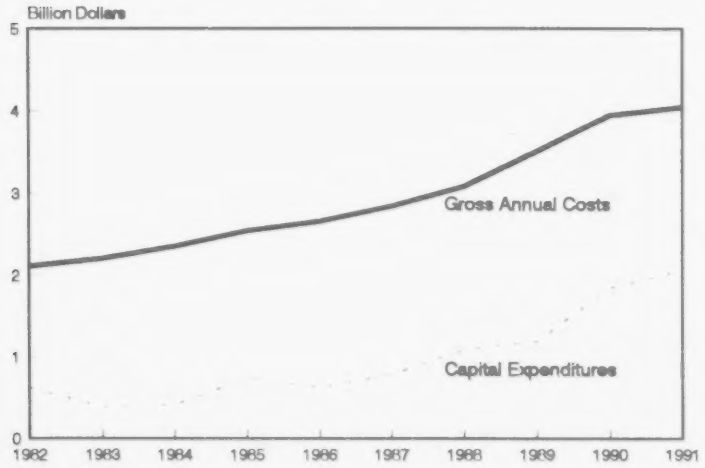
Source: CMA member companies

As with TRI, releases have not been reduced by increasing transfers to treatment facilities: Transfers of "33-50" chemicals to treatment facilities fell even faster than releases, at an average annual rate of 21 percent.

Improvements in the environment have not been without costs. Pollution abatement costs of U.S. industry -- both capital expenditures and operating costs for pollution control -- are rising rapidly both in current dollars and relative to GNP:

Chart 7.20

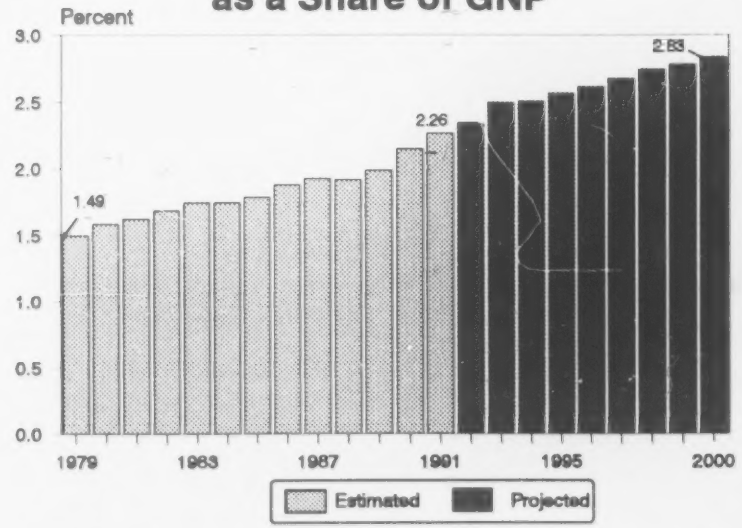
Chemical Industry Pollution Abatement



Source: Bureau of the Census

Chart 7.21

Total Annual Pollution Abatement Costs as a Share of GNP



Source: Environmental Investments: The Cost of a Clean Environment, EPA, 1990

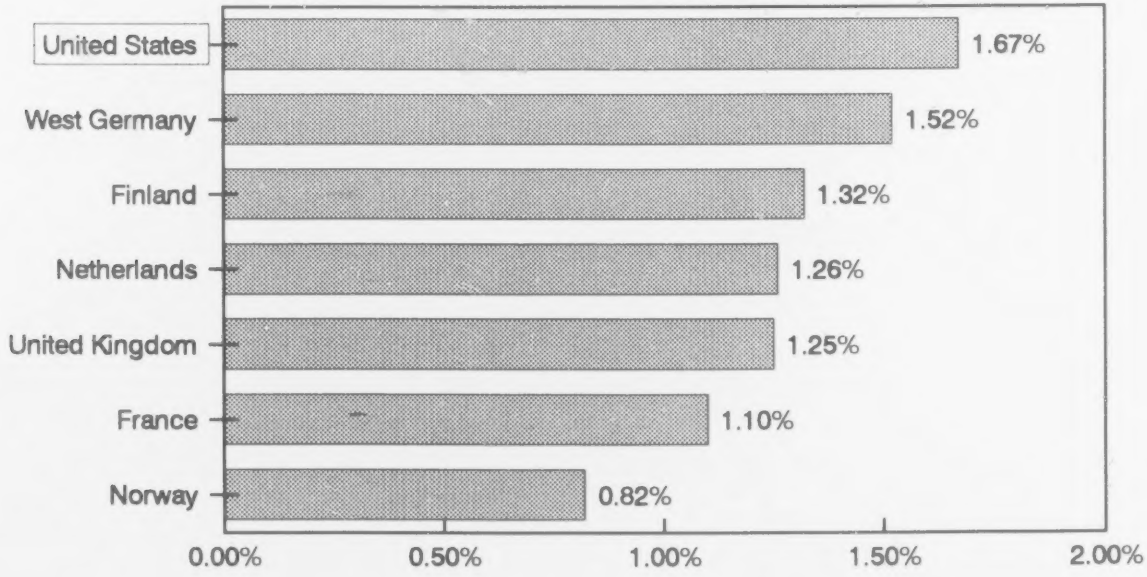
U.S. Pollution abatement and control spending reached $112 billion in 1991, about 2.0 percent of GNP. According to EPA estimates, based on programs existing before enactment of amendments to the Clean Air Act, U.S. spending will rise to about 2.83 percent of GNP by the year 2000. New programs may raise this percentage still higher. Moreover, these costs include only direct expenditures for pollution control. They do not include all of the indirect costs of controls -- such as compliance-related R&D, the costs of following and interpreting regulatory changes, the costs of obtaining permits, legal expenses, etc..

EPA data show the United States was spending more for pollution control than competitor countries in 1985, the most recent year for which comparative data are available. Recent actions, including the Clean Air Act Amendment of 1990, may have widened the gap.

Chart 7.22

Pollution-Control Expenditures: Selected OECD Countries, 1985

(Percent of GNP)



Source: OECD

TABLE 7.12

POLLUTION ABATEMENT: GROSS ANNUAL COSTS*

(Millions of Dollars)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Manufacturing	n/a	8,142	8,565	9,925	10,888	11,678	12,258	13,488	14,009	15,625	17,070	17,387	n/a
Air	n/a	3,298	3,456	3,807	4,189	4,330	4,262	4,269	4,467	4,694	5,011	5,034	n/a
Water	n/a	3,193	3,489	3,943	4,296	4,610	4,820	4,907	5,276	5,853	6,416	6,345	n/a
Solid Waste	n/a	1,651	1,620	2,175	2,403	2,738	3,177	4,312	4,266	5,078	5,643	6,008	n/a
Chemicals & Allied Products	n/a	1,852	2,107	2,198	2,345	2,540	2,654	2,836	3,075	3,509	3,944	4,048	n/a
Air	n/a	540	556	625	622	673	647	678	706	794	842	880	n/a
Water	n/a	943	1,112	1,106	1,206	1,268	1,302	1,292	1,429	1,614	1,799	1,787	n/a
Solid Waste	n/a	369	438	467	517	599	706	866	940	1,101	1,303	1,381	n/a

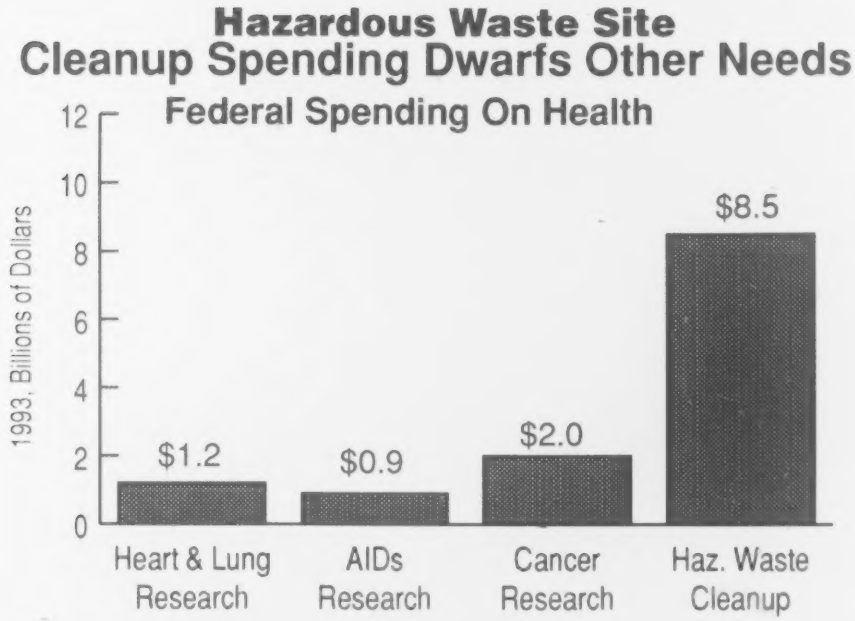
* Data series begin in 1973

Source: Bureau of the Census

Chart 7.23

Pollution-Abatement Costs: Composition in 1991

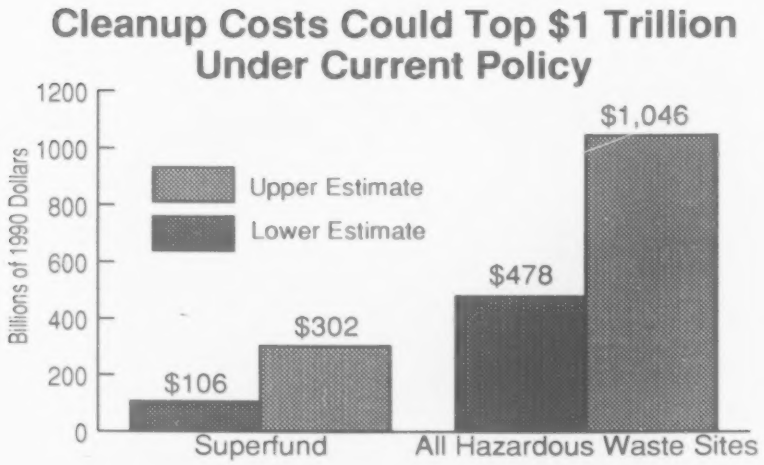
Chart 7.24



Source: Budget of the United States Government, Fiscal Year 1994

Most hazardous waste sites rank relatively low on EPA's list of environmental risk priorities. Nevertheless, in 1993 the Federal government alone--excluding private party and local and state governments costs--will spend $8.5 billion on hazardous waste cleanups. Over $7 billion will come from general revenues. That total is about **half** of the federal government's environmental budget and **more than double federal spending on cancer, heart disease, and AIDS research combined.** If America had unlimited resources and no other environmental and societal needs, massive and inefficient cleanup spending might be of little concern. In that case, spending hundreds of billions of dollars to meet standards that ignore current or planned site use and demand preindustrial levels of purity might not be disastrous. But resources **are** limited. There **are** many competing needs. Setting and following priorities **is** critically important.

Chart 7.25



Source: Hazardous Waste Reduction: The Task Ahead, Waste Management Research and Education Institute, University of Tennessee

Moreover, the EPA calculations reflect only a fraction of the future costs of the cleanup of hazardous waste sites under the Resource Conservation and Recovery Act (RCRA) and the Superfund law (CERCLA). These costs have been soaring and, depending on the cleanup standards that are applied and how the program is administered, could be huge. A University of Tennessee study estimates Superfund costs -- the cost of cleanup of inactive hazardous waste sites -- could reach $302 billion over the next thirty years. But the Superfund program has led the way in establishing cleanup standards for other programs and the Tennessee group estimates that applying Superfund rules to other hazardous waste sites could push cleanup costs to over $1 trillion. This includes Federal Department of Energy and Department of Defense sites costs of $270 billion payable from federal revenues. The University of Tennessee analysts also say that an alternative approach could provide equal protection of human health and the environment for as little as $373 billion, saving as much as $673 billion.

TABLE 7.13

POLLUTION ABATEMENT AND CONTROL: TOTAL U.S. SPENDING

(Billions of Dollars)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1990/80	1991/90
Gross Domestic Product	1,010.7	2,708.0	3,149.6	3,405.0	3,777.2	4,038.7	4,268.6	4,539.9	4,900.4	5,244.0	5,522.2	5,677.5	5,951	7.4%	2.8%
% Pollution Abatement & Control	n/a	1.90%	1.80%	1.76%	1.76%	1.76%	1.74%	1.69%	1.66%	1.61%	1.63%	1.61%	n/a	-1.5%	-1.2%
Pollution Abatement & Control Spending	n/a	51.48	56.58	60.00	66.45	70.94	74.18	76.67	81.47	84.40	90.00	91.46	n/a	5.7%	1.6%
Business	n/a	30.62	34.15	35.36	39.47	41.56	42.64	44.50	47.20	50.06	55.06	57.14	n/a	6.0%	3.8%
Government & Other	n/a	20.86	22.43	24.65	26.98	29.38	31.54	32.17	34.27	34.34	34.94	34.32	n/a	5.3%	-1.8%

Source: Bureau of Economic Analysis

TABLE 7.14

POLLUTION ABATEMENT: CAPITAL EXPENDITURES*

(Millions of Dollars)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Manufacturing	n/a	3,503	3,024	2,045	2,172	2,810	2,847	3,053	3,423	4,310	6,031	7,390	n/a
Air	n/a	2,105	1,828	1,029	1,038	1,292	1,463	1,499	1,524	1,819	2,562	3,706	n/a
Water	n/a	1,147	977	819	887	1,018	1,039	1,101	1,290	1,825	2,651	2,815	n/a
Solid Waste	n/a	251	219	197	247	500	345	453	610	666	818	869	n/a
Chemicals & Allied Products	n/a	781	628	395	418	738	624	790	1,095	1,195	1,852	2,066	n/a
Air	n/a	326	273	159	143	194	198	259	371	380	596	816	n/a
Water	n/a	350	257	187	212	272	325	375	488	599	995	942	n/a
Solid Waste	n/a	105	98	49	63	273	101	156	237	216	261	308	n/a

* Data series begin in 1973

Source: Bureau of the Census

There are wide variances in the cost effectiveness of environmental and health and safety regulations:

TABLE 7.15
RISKS AND COST-EFFECTIVENESS OF SELECTED REGULATIONS AFFECTING THE U.S. CHEMICAL INDUSTRY

Regulation *1	Year Issued	Health or Safety	Agency	Baseline Mortality Risk per Million Exposed	Cost per Premature Death Averted ($ Millions 1990)
Underground Construction Standards *2	1989	S	OSHA	38,700	0.1
Trihalomethane Drinking Water Standards	1979	H	EPA	420	0.2
Hazard Communication Standard *2	1983	S	OSHA	1,800	1.6
Benzene NESHAP (Original: Fugitive Emissions)	1984	H	EPA	1,470	3.4
Ethylene Dibromide Drinking Water Standard	1991	H	EPA	NA	5.7
Benzene NESHAP (Revised: Coke By-Products) *2	1988	H	EPA	NA	6.1
Asbestos Occupational Exposure Limit *2	1972	H	OSHA	3,015	8.3
Benzene Occupational Exposure Limit *2	1987	H	OSHA	39,600	8.9
Arsenic Emission Standards for Glass Plants	1986	H	EPA	2,660	13.5
Ethylene Oxide Occupational Exposure Limit *2	1984	H	OSHA	1,980	20.5
Arsenic/Copper NESHAP	1986	H	EPA	63,000	23.0
Haz Waste Listing for Petroleum Refining Sludge	1990	H	EPA	210	27.6
Benzene NESHAP (Revised: Transfer Operations)	1990	H	EPA	NA	32.9
Acrylonitrile Occupational Exposure Limit *2	1978	H	OSHA	42,300	51.5
Abestos Occupational Exposure Limit *2	1986	H	OSHA	3,015	74.0
Arsenic Occupational Exposure Limit *2	1978	H	OSHA	14,800	106.9
Abestos Ban	1989	H	EPA	NA	110.7
Diethylstilbestrol (DES) Cattlefeed Ban	1979	H	FDA	22	124.8
Benzene NESHAP (Revised: Waste Operations)	1990	H	EPA	NA	168.2
1,2 - Dichloropropane Drinking Water Standard	1991	H	EPA	NA	653.0
Haz Waste Land Disposal Ban (1st 3rd)	1988	H	EPA	2	4,190.4
Municipal Solid Waste Landfill Standards (Proposed)	1988	H	EPA	<1	19,107.0
Formaldehyde Occupational Exposure Limit *2	1987	H	OSHA	31	86,201.8
Atrazine/Alachlor Drinking Water Standard	1991	H	EPA	NA	92,069.7
Haz Waste Listing for Wood Preserving Chemicals	1990	H	EPA	<1	5,700,000.0

*1 - 70-year lifetime exposure assumed unless otherwise specified.
*2 - 45-year lifetime exposure.
NA - Not Available.

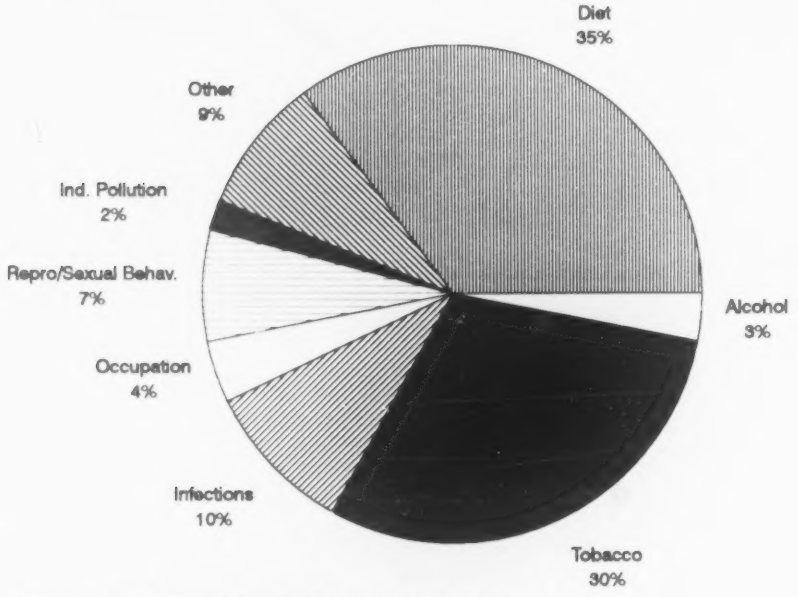
Source: John F. Morrall, III, "A Review of The Record", Regulation, Vol 10, No. 2 (1986), p. 30. Updated by Morrall, et al.

Cost-effectiveness analysis , a form of cost-benefit analysis, attempts to determine the least cost of achieving a regulatory objective, in most cases the cost of saving a (statistical) life. Baseline risks generally reflect the mortality risk per million of statistical lives exposed. In most cases the actual number of persons exposed is much less. Further, a 70- or 45-year lifetime exposure is often assumed. Given the mobility of the American labor force, actual exposure is often much lower. The cost per premature death prevented is based on the cost per estimated statistical life saved from regulatory policies. Because the actual risk is often lower, these figures may understate actual costs per life saved.

Concerns about cancer are a major factor in concern about reducing pollution. But air and water pollution from industrial sources typically are the cause of only a relatively small portion of total incidence of cancer, estimated at about 2 percent of the total:

Chart 7.26

Causes of Cancer in the United States



Source: The Causes of Cancer; Quantitative Estimates of Avoidable Risks Of Cancer in the United States By Richard Doll & Richard Peto (1981). Journal of The National Cancer Institute, 1981, 66(6): 1195-1308.

Tobacco smoking, primarily, and diet are the dominant causes of cancer, accounting for about two-thirds of the total.

Since 1982 fatalities involving transportation of hazardous material have averaged 10 annually. Gasoline and other petroleum products averaged over 8 per year; chemicals less than two annually.

TABLE 7.16

OCCUPATIONAL INJURY & ILLNESS RATES*
(per 100 full-time employees)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total Private Sector:													
Total Cases	n/a	8.7	7.7	7.6	8.0	7.9	7.9	8.3	8.6	8.6	8.8	8.4	n/a
Lost Workday Cases	n/a	4.0	3.5	3.4	3.7	3.6	3.6	3.8	4.0	4.0	4.1	3.9	n/a
Lost Workdays	n/a	65.2	58.7	58.5	63.4	64.9	65.8	69.9	76.1	78.7	84.0	86.5	n/a
Manufacturing:													
Total Cases	n/a	12.2	10.2	10.0	10.6	10.4	10.6	11.9	13.1	13.1	13.2	12.7	n/a
Lost Workday Cases	n/a	5.4	4.4	4.3	4.7	4.6	4.7	5.3	5.7	5.8	5.8	5.6	n/a
Lost Workdays	n/a	65.2	75.0	73.5	77.9	80.2	80.6	95.5	107.4	113.0	120.7	121.5	n/a
Chemicals & Allied Products:													
Total Cases	n/a	12.2	5.7	5.5	5.3	5.1	6.3	7.0	7.0	7.0	6.5	6.4	n/a
Lost Workday Cases	n/a	5.4	2.5	2.5	2.4	2.3	2.7	3.1	3.3	3.2	3.1	3.1	n/a
Lost Workdays	n/a	50.3	39.4	42.3	40.8	38.8	49.4	58.8	59.0	63.4	61.6	62.4	0

* Data series begin in 1972 and 1973
Source: Bureau of Labor Statistics

TABLE 7.17

TRANSPORTATION INCIDENTS, INJURIES, AND FATALITIES INVOLVING HAZARDOUS MATERIALS

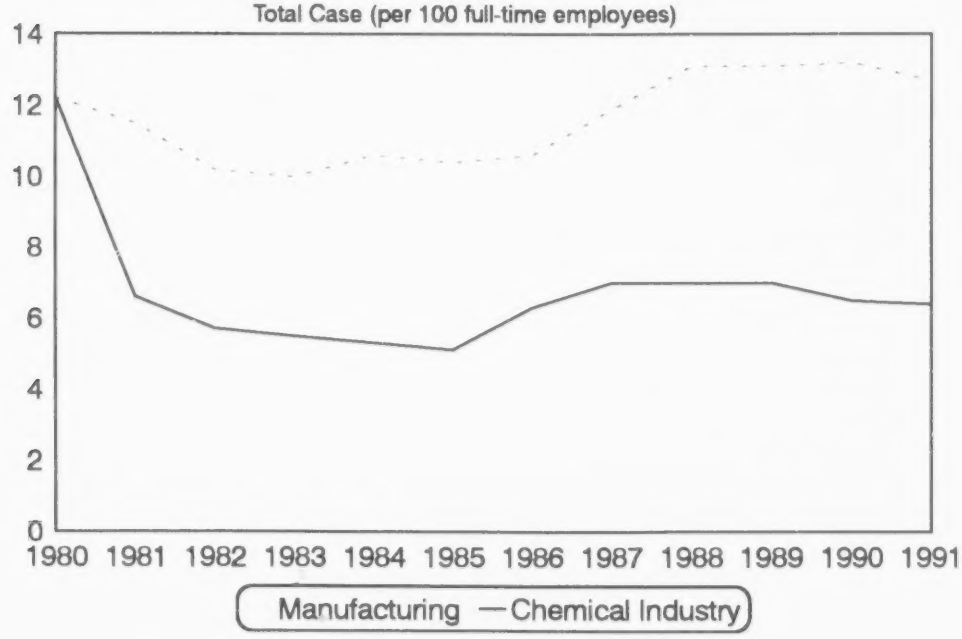
	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total Incidents	n/a	15,737	6,615	5,819	5,764	6,019	5,759	6,138	6,185	7,545	8,687	n/a	n/a
Total Injuries	n/a	626	125	189	259	253	316	331	171	329	390	n/a	n/a
Total Fatalities, by Material:	n/a	19	13	8	7	8	17	10	15	8	4	10	n/a
Gasoline	n/a	n/a	3	5	0	5	10	6	4	6	3	8	n/a
Other Petroleum Products	n/a	n/a	8	3	2	2	5	1	10	1	0	2	n/a
Chemicals	n/a	n/a	2	0	5	0	2	3	1	1	1	0	n/a
Other Materials	n/a	n/a	0	0	0	1	0	0	0	0	0	0	n/a

Source: Department of Transportation

The chemical industry's incidence of injury and illness is one of American industry's lowest:

Chart 7.27

Incidence of Injury and Illness



Changes in reporting requirements in 1985 coupled with improved reporting may be significant factors in trends observed in the period from 1985 to 1989.

Section 8
Energy

The U.S. chemical industry is energy intensive and relies on energy inputs not only as fuel and power for its operations, but also as raw materials, or feedstocks, in the manufacture of many of its products. For example, oil and gas are raw materials for the manufacture of organic chemicals. The term energy as used in this publication includes consumption for both feedstocks and as fuel and power for production processes. Chemical industry energy consumption for both of these purposes amounted to 5.4 quads (quadrillion BTUs) in 1992, about 7 percent of total U.S. energy consumption. The industry's total energy needs are equivalent to about 2.6 million barrels of crude oil per day, but are drawn from a wide mix of energy sources:

Crude Oil and Derivatives	45%
Natural Gas	30%
Electricity	17%
Coal	6%
Others	2%
Total	100%

Fuel and power accounted for 52 percent (2.9 quads) of total chemical industry energy consumption, with feedstocks accounting for the remaining 2.6 quads (48 percent). The chemical industry is the single largest user of natural gas, accounting for 10 percent of all U.S. natural gas consumption. The chemical industry is also a large user of petroleum products, accounting for about 8 percent (1.4 million barrels of oil per day) of all U.S. petroleum products consumption.

Energy represents a significant share of U.S. chemical industry manufacturing costs. For some products, energy for both fuel and power needs and feedstocks account for up to 85 percent of total production costs. In 1992, the industry spent an estimated $23 billion on purchases of fuel and power and feedstocks.

Overall, however, this energy cost represents only 8 percent of the value of industry shipments. Moreover, value-added by the chemical industry is equivalent to five times this energy cost, which is just one of many inputs, including raw materials and services, that the chemical industry purchases from other industries.

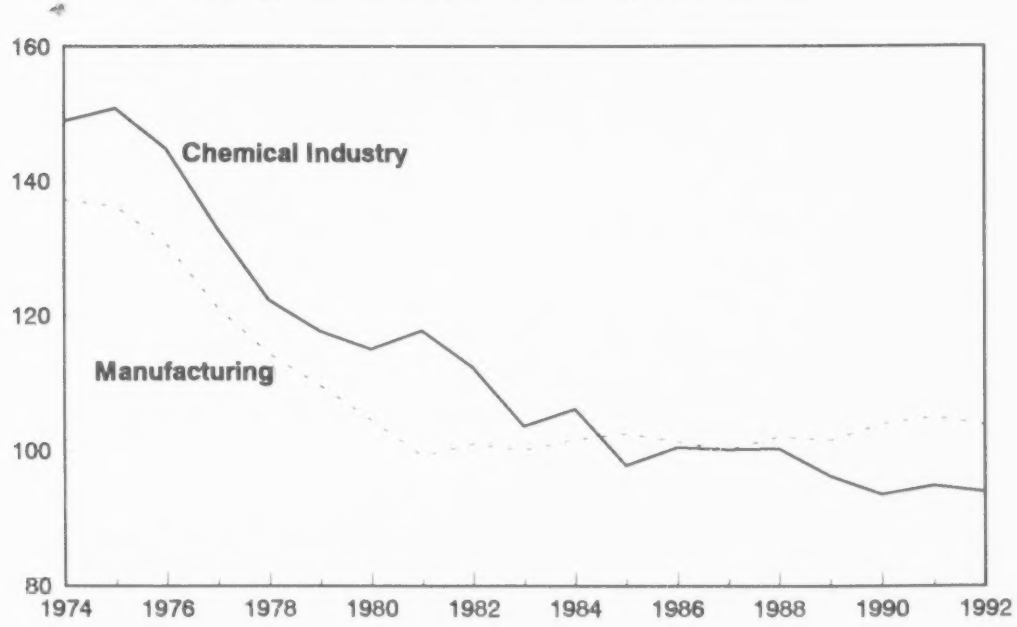
The U.S. chemical industry has achieved significant energy efficiency gains. Energy consumption per unit of output declined by over 44 percent between 1970 and 1992, a trend that will most likely continue. Indeed, further improvements in energy efficiency are essential for the U.S. chemical industry to maintain its competitive edge in domestic and world markets.

During the past decade, the U.S. chemical industry has made significant progress in improving energy efficiency:

Chart 8.1

Fuel & Power Energy Efficiency Trends

Energy consumed per unit of output; 1987=100



Source: Federal Reserve Board, Department of Energy, CMA

TABLE 8.1

CHEMICAL INDUSTRY: TOTAL ENERGY CONSUMPTION

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates 1992/82	1992/87	1992/91
Chemical Industry GDP (Billion 1987 Dollars)	n/a	58	64	68	66	67	75	82	83	84	88	n/a	n/a			
(BTUs/Thousand Dollars)	n/a	915	670	625	714	682	643	595	623	607	601	n/a	n/a			
Energy Consumption: (Trillions of BTUs)	4,132	5,264	4,274	4,257	4,741	4,567	4,809	4,896	5,180	5,103	5,287	5,440	5,554	2.7%	2.6%	2.1%
Fuel and Power	2,528	2,721	2,474	2,442	2,613	2,407	2,559	2,694	2,862	2,829	2,814	2,843	2,905	1.6%	1.5%	2.2%
Feedstocks	1,604	2,543	1,800	1,815	2,128	2,160	2,250	2,202	2,318	2,274	2,473	2,597	2,649	3.9%	3.8%	2.0%
As a Share of the Total:																
Fuel and Power	61.2%	51.7%	57.9%	57.4%	55.1%	52.7%	53.2%	55.0%	55.3%	55.4%	53.2%	52.3%	52.3%			
Feedstocks	38.8%	48.3%	42.1%	42.6%	44.9%	47.3%	46.8%	45.0%	44.7%	44.6%	46.8%	47.7%	47.7%			

Source: Bureau of Economic Analysis, CMA estimates (see below)

TABLE 8.2

FUEL AND POWER CONSUMPTION
(Trillions of BTUs)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates 1992/82	1992/87	1992/91
Manufacturing	12,710	11,946	11,224	11,737	13,170	13,615	13,846	14,512	15,489	15,674	15,992	15,806	16,100	3.7%	2.1%	1.9%
Chemicals & Allied Products	2,528	2,721	2,474	2,442	2,613	2,407	2,559	2,694	2,862	2,829	2,814	2,843	2,905	1.6%	1.5%	2.2%
Chemicals as a % of Manufacturing	19.9%	22.8%	22.0%	20.8%	19.8%	17.7%	18.5%	18.6%	18.5%	18.0%	17.6%	18.0%	18.0%			

Sources: Bureau of the Census, Federal Reserve Board, Department of Energy, CMA estimates

TABLE 8.3

CHEMICAL INDUSTRY: FEEDSTOCK CONSUMPTION
(Trillions of BTUs)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates 1992/82	1992/87	1992/91
Total Feedstock Consumption	1,604	2,543	1,800	1,815	2,128	2,160	2,250	2,202	2,318	2,274	2,473	2,597	2,649	3.9%	3.8%	2.0%
Liquefied Gases	381	508	461	500	809	814	744	748	813	777	794	863	904	7.0%	3.9%	4.8%
Heavy Liquids	559	1,422	925	880	831	828	1,045	995	1,033	1,027	1,194	1,239	1,229	2.9%	4.3%	-0.8%
Natural Gas	624	586	393	414	468	500	442	441	455	452	468	478	499	2.4%	2.5%	4.4%
Coal	41	27	21	20	20	19	19	18	17	18	17	17	18	-1.4%	0.0%	5.9%

* Some propane and propylene consumption is included in the natural gas data
Sources: American Gas Association, Bureau of the Census, Bureau of Mines, Department of Energy, CMA estimates

TABLE 8.4

ELECTRIC POWER USE
(1987=100)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates 1992/82	1992/87	1992/91
Manufacturing	n/a	96.9	87.1	90.8	97.8	95.5	96.1	100.0	104.7	107.9	109.2	108.0	110.8	2.4%	2.1%	2.6%
Chemicals & Allied Products	n/a	100.9	92.4	97.5	102.0	99.0	98.0	100.0	100.3	110.4	114.7	113.6	119.8	2.6%	3.7%	5.5%
Industrial Inorganic Chemicals	n/a	109.0	98.8	101.6	106.5	100.9	98.4	100.0	96.3	112.9	119.2	116.1	122.9	2.2%	4.2%	5.9%
Plastics Materials and Synthetics	n/a	79.8	73.0	86.7	91.2	90.9	95.5	100.0	107.2	107.9	106.9	107.6	109.6	4.1%	1.9%	1.9%
Drugs	n/a	73.7	79.1	83.8	86.6	90.0	97.0	100.0	107.2	105.6	107.8	113.4	119.6	4.2%	3.6%	5.5%
Soaps, Cleaners, and Toilet Goods	n/a	79.5	79.9	86.1	88.4	92.0	98.5	100.0	107.6	112.1	114.4	117.1	114.1	3.6%	2.7%	-2.6%
Industrial Organic Chemicals	n/a	138.1	122.4	126.1	113.6	106.5	99.6	100.0	95.1	100.6	107.7	104.9	107.9	-1.3%	1.5%	2.9%
Agricultural Chemicals	n/a	134.0	117.1	107.9	115.5	111.3	102.1	100.0	104.7	104.3	103.5	104.5	105.3	-1.1%	1.0%	0.8%

Source: Federal Reserve Board

TABLE 8.5

ENERGY INPUT PRICES
(Current Dollars)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Rates of Change: 1992/82	1992/87	1992/91
Imported Crude Oil ($/barrel)	n/a	32.37	32.02	27.81	27.6	25.84	12.52	16.69	13.25	16.89	20.37	16.89	16.76	-6.3%	0.1%	-0.8%
Domestic Crude Oil, Wellhead ($/barrel)	3.18	21.59	28.52	26.19	25.88	24.09	12.51	15.40	12.58	15.86	20.03	16.54	15.98	-5.6%	0.7%	-3.4%
Natural Gas, Wellhead ($/1000 cu. ft.)	0.17	1.59	2.46	2.59	2.66	2.51	1.94	1.67	1.69	1.69	1.71	1.64	1.85	-2.8%	2.1%	12.8%
Coal, Mine Value ($/ton)	6.26	24.52	27.14	25.85	25.51	25.10	23.70	23.00	22.00	21.76	21.71	21.75	21.25	-2.4%	-1.6%	-2.3%
Industrial Electricity Rates (cents/kWh)	n/a	3.7	5.0	5.0	5.0	5.2	4.9	4.7	4.6	4.7	4.7	4.8	4.8	-0.4%	0.4%	0.0%

Source: Department of Energy

TABLE 8.6

U.S. OIL IMPORT DEPENDENCE
(Thousands of Barrels per Day)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Rates of Change: 1992/82	1992/87	1992/91
Petroleum Products Consumed	14,695	17,056	15,296	15,231	15,726	15,726	16,281	16,665	17,283	17,325	16,988	16,714	17,006	1.1%	0.4%	1.7%
Crude Oil and Petroleum Products Imports	3,419	6,909	5,113	5,051	5,437	5,067	6,224	6,678	7,402	8,061	8,018	7,627	7,844	4.4%	3.3%	2.8%
% Supplied by imports	23.3%	40.5%	33.4%	33.2%	34.6%	32.2%	38.2%	40.1%	42.8%	46.5%	47.2%	45.6%	46.1%	3.3%	2.9%	1.1%
Deficit in Oil (Billions of Dollars)	n/a	75.80	54.11	48.66	52.45	45.77	31.50	38.36	35.09	44.68	54.68	44.40	44.83	-1.9	3.2%	1.0%

Source: Department of Energy

TABLE 8.7

U.S. EMISSIONS OF CARBON DIOXIDE: ALL INDUSTRIES & ALL USES
(Millions of Metric Tons of Carbon)

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates: 1992/82	1992/87	1992/91
Total Carbon Dioxide Emissions	1,165	1,260	1,146	1,150	1,189	1,202	1,205	1,254	1,314	1,329	1,318	1,305	1,327	1.5%	1.1%	1.7%
Solid Fuels	322	395	390	406	428	448	440	463	491	498	495	491	495	2.4%	1.3%	0.8%
Liquid Fuels	515	581	502	500	507	506	531	545	566	567	550	539	548	0.9%	0.1%	1.7%
Gas Fuels	312	273	245	234	242	237	223	234	245	252	262	264	272	1.1%	3.1%	3.0%
Cement	9	9	8	9	10	10	10	10	10	10	9	9	10	2.3%	0.0%	11.1%
Gas Flaring	7	2	1	1	2	1	1	2	2	2	2	2	2	7.2%	0.0%	0.0%

Source: Oak Ridge National Laboratory
1991 and 1992 data are CMA estimates based on DOE data.

Section 9
State Chemical Industries

The regions and states of the United States are economically interdependent. Each state's economy depends on the continuing availability of goods and services from other states and on its ability to sell its goods and services throughout the nation.

The U.S. chemical industry converts certain petroleum products, natural gas, and other naturally occurring raw materials into a wide variety of basic chemicals. These basic chemicals (including petrochemicals such as ethylene, propylene, and butadiene) are then converted by other sectors of the chemical industry into chemical intermediates (phthalic anhydride, vinyl chloride, etc.) and final chemical products such as plastics, man-made fibers, synthetic rubber, etc. In turn, these chemical industry products are fabricated by many different industries into thousands of essential industrial and consumer products.

The United States was an early leader in developing a chemical industry. The industry has gone through several growth phases, the first of which centered around 1900. The most recent period of rapid growth began during World War II. Much of this growth in the basic chemicals (and petrochemicals) segment of the industry has been concentrated along the U.S. Gulf Coast, where petroleum and natural gas raw materials (or feedstocks) are available. Much of basic chemicals production is still concentrated in the Gulf Coast area, with Texas and Louisiana producing about 70 percent of all primary petrochemicals. The conversion of these basic chemicals into plastics, man-made fibers, synthetic rubber, and other chemical products is not as heavily concentrated on the Gulf Coast. Instead, the foci of production tend to be more diffuse. For example, the majority of total man-made fiber production occurs in the Southeast, while production of other chemical products such as plastics, pharmaceuticals, and fertilizers is even more widely dispersed among the states.

In rank order, the ten leading states in shipments of chemical products are Texas, New Jersey, Louisiana, Illinois, Ohio, California, North Carolina, Pennsylvania, New York, and Indiana. Combined, the chemical industry in these 10 states employed 602,600 people and accounted for 63 percent of total chemical industry shipments in 1991 and about the same proportion of total industry employment.

Although the chemical industry makes a vital contribution to the economy of every state, 63 percent of chemical production is concentrated in 10 states.

Chart 9.1

Chemical Shipments by State - 1991

($292.3 Billion)

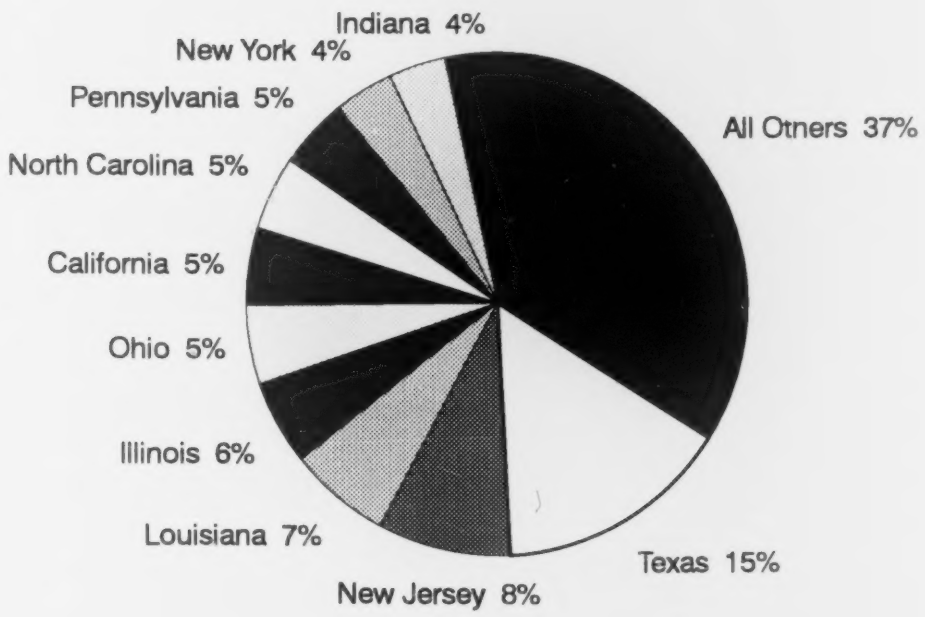
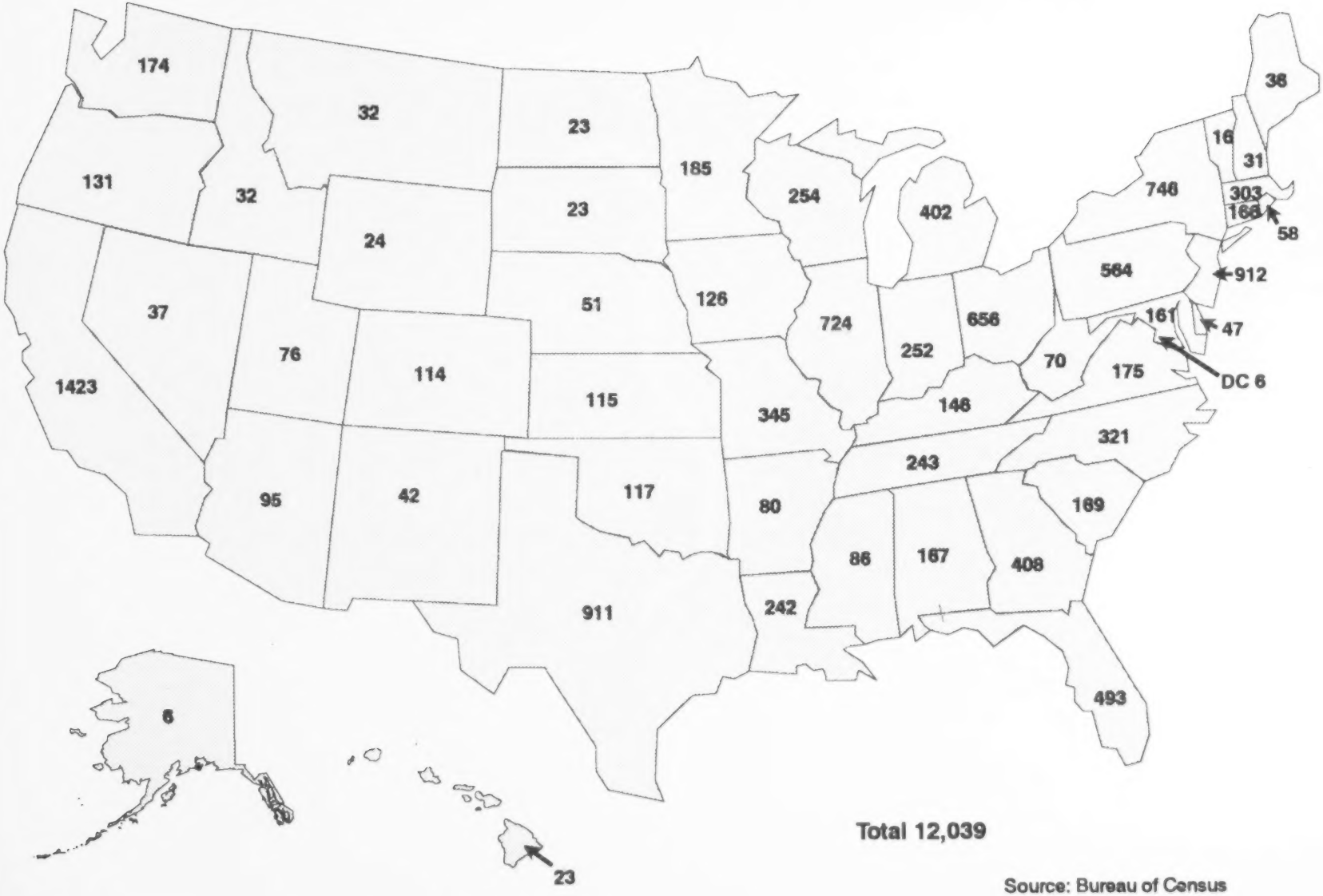


TABLE 9.1
TOP 30 CHEMICAL PRODUCING STATES

State	Value of Chemical Shipments (million $) 1991	Chemical Gross State Product (million $) 1989	Total Gross State Product (million $) 1989	Chemical % of Total Product (%) 1989	Chemical Employment (thousands) 1991	Wages and Salaries (million $) 1991	Chemical Establishments (number) 1987	Chemical Exports * (million $) 1989
1 Texas	44,825	9,834	340,057	2.9%	85.3	5,979	911	12,517
2 New Jersey	24,636	10,856	203,375	5.3%	116.4	6,613	912	3,350
3 Louisiana	19,589	2,985	79,138	3.8%	29.5	1,623	242	4,782
4 Illinois	16,092	6,669	256,478	2.6%	63.7	3,207	724	3,258
5 Ohio	14,571	5,889	211,545	2.8%	66.2	3,130	656	2,367
6 California	14,272	6,359	697,381	0.9%	71.9	3,417	1,423	2,065
7 North Carolina	14,076	3,309	130,085	2.5%	43.6	2,592	321	2,370
8 Pennsylvania	13,633	5,867	227,898	2.6%	64.6	3,368	564	1,510
9 New York	11,430	5,953	441,068	1.3%	61.4	3,074	746	2,071
10 Indiana	10,752	3,278	105,314	3.1%	32.4	1,873	252	1,600
11 Tennessee	9,548	2,498	92,267	2.7%	39.9	1,848	243	2,276
12 Michigan	9,211	3,348	181,827	1.8%	45.5	2,255	402	1,675
13 South Carolina	8,788	3,273	60,150	5.4%	40.9	1,767	169	2,570
14 Virginia	7,585	2,419	136,497	1.8%	29.2	1,204	175	2,123
15 Missouri	7,024	3,183	100,081	3.2%	30.1	1,535	583	1,023
16 Florida	6,735	1,578	226,964	0.7%	22.6	903	493	2,391
17 Georgia	6,556	1,977	129,776	1.5%	19.5	743	408	1,007
18 Kentucky	5,239	1,178	65,858	1.8%	15.0	719	146	1,096
19 West Virginia	4,866	1,533	27,922	5.5%	17.6	868	70	1,351
20 Alabama	4,654	922	67,886	1.4%	12.0	525	167	797
21 Maryland	3,784	1,347	99,074	1.4%	14.1	600	161	501
22 Connecticut	3,737	1,922	88,863	2.2%	22.5	1,258	166	590
23 Wisconsin	3,137	1,018	93,978	1.1%	11.5	503	254	207
24 Massachusetts	3,112	1,444	144,791	1.0%	17.8	829	303	540
25 Iowa	3,054	1,147	52,574	2.2%	7.1	256	126	426
26 Delaware	2,818	2,436	15,418	15.8%	33.9	2,272	47	442
27 Washington	2,489	933	96,233	1.0%	13.8	603	174	222
28 Kansas	2,343	798	48,829	1.6%	7.4	279	115	204
29 Minnesota	2,083	726	93,559	0.8%	10.2	398	185	148
30 Mississippi	2,043	581	38,135	1.5%	7.1	391	86	692
United States	292,326	98,763	5,164,671	1.9%	1,092.4	56,108	12,039	57,965

* Includes both direct and supporting exports.
Source: Bureau of the Census, Bureau of Economic Analysis

Number of Chemical Establishments, 1987



Total 12,039

Source: Bureau of Census

Section 10
Distribution

Because of the geographic dispersion of the U.S. chemical industry's customers and the concentration of much of chemicals production in about a dozen states, a large volume of chemicals and allied products are moved internally within the United States every year. In 1992, about 520 million tons of chemicals and allied products, were shipped via domestic truck, rail, water, and other means. These shipments originated and ended within the United States and do not include rail and truck shipments to/from Canada and Mexico. Also not included are the nearly 60 million tons of chemicals and allied products of overseas maritime transport, overnight and local delivery services for packages, and movements via the U.S. Postal Service. The volume of chemical and allied products moved within the United States is important to the transportation services industry, generating nearly $10 billion in revenues for trucking companies, railroads, barge operators, and other carriers.

Because each individual chemical has its own unique physical properties, the transport of chemicals can present unique challenges. Some chemicals, such as chlorine, are gases at normal temperatures and must be liquefied under pressure for transportation. Others, such as hydrochloric acid, are corrosive and require special materials in the construction of the shipping containers.

Nearly one-half of the tonnage of chemicals and allied products shipped is transported less than 200 miles. This is typical of shipments of bulk, low value-added commodity chemicals such as fertilizers and industrial inorganic chemicals. Chemicals that present handling problems, such as industrial gases and other chemical products that are marketed on a regional basis, also often are shipped shorter distances. On the other hand, high value-added products are often shipped much longer distances. Overall, the cost of transportation accounts for about five percent of the industry's value of shipments. This varies, of course, among differing chemical products.

About 52 percent of all chemicals and allied products tonnage is shipped by trucks. In 1992, an estimated 269 million tons were shipped via this mode. About 65 percent of the chemicals shipped via trucks is by truckloads for hire and about 5 percent is via less-than-truckload for hire. The U.S. chemical industry generates about $4.4 billion in revenues to the trucking industry. The remaining 30 percent of chemicals shipped via trucks is by private carriers (i.e. chemical companies).

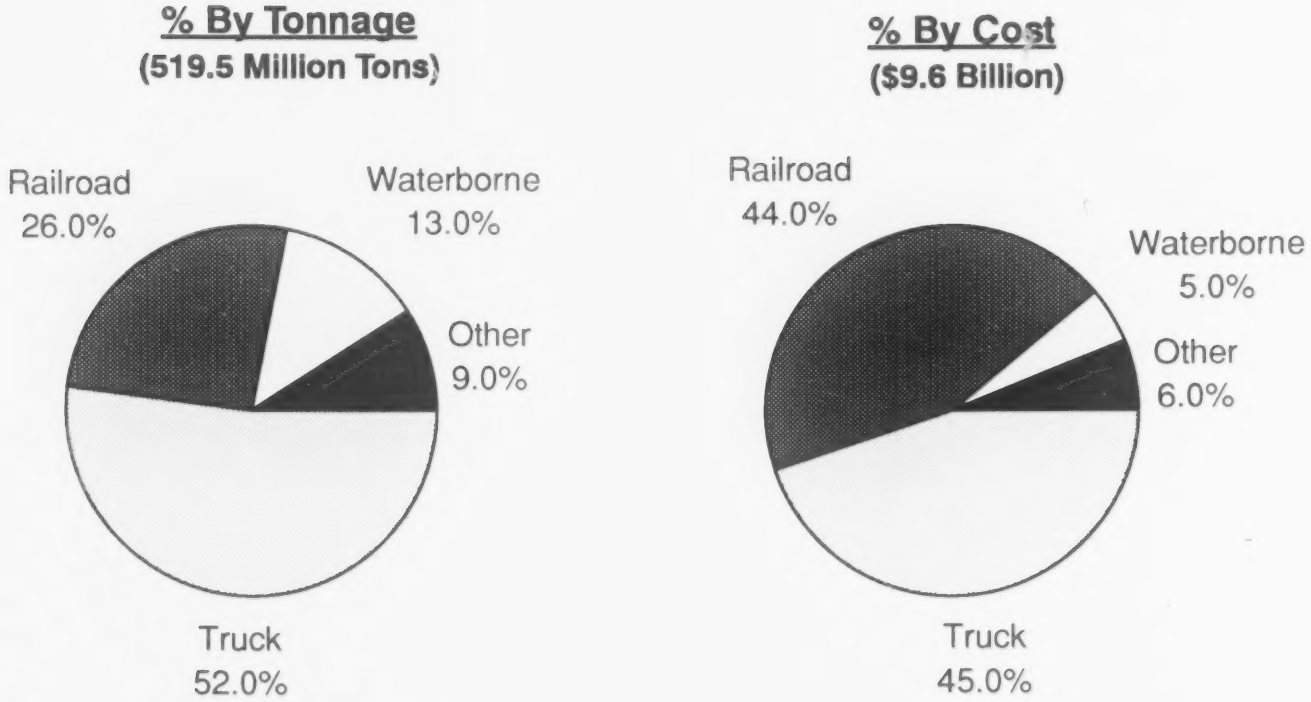
Over the past several decades, trucks have taken market share from the railroads in transporting chemicals because of the flexibility and quick delivery that this mode of transport offers. This has become increasingly important with the advent of lean manufacturing and just-in-time (JIT) inventory management techniques. Trucks have increasingly been used for bulk shipments of intermediate chemicals, although trucking is most widely used for small-volume packaged chemical products. Trucks are the most common mode of transport used in shipping industrial gases and consumer products.

Railroads account for 26 percent of the tonnage of chemicals and allied product shipments, about 137 million tons in 1992. The chemical industry is important to the railroad industry, generating $4.2 billion in revenue for the railroads, about 14 percent of their total. The chemical industry accounts for about 9 percent of the volume of rail freight, the railroads third largest commodity group. Rail is the most common mode used in the transport of commodity chemicals such as chlorine, alkalies, fertilizers, bulk petrochemicals, and industrial inorganic chemicals. These chemicals are shipped in tank cars (liquids and liquefied gases), hopper cars (dry commodities), and box cars (dry bulk or packaged chemical products).

Waterborne transport accounted for about 13 percent of intra-U.S. chemical shipments in 1992, about 66 million tons. Intra-U.S. waterborne transport includes coastal, lake, and inland waterway transportation of goods. Inland waterways include the Mississippi, Tennessee, Ohio, and Missouri waterway systems, among others. Inland waterways accounted for about 69 percent of all waterborne transportation in 1992, about 45 million tons. Carrier revenues for waterborne transportation of chemicals and allied products amounted to about $440 million. Of this, inland waterways — primarily towed barges — accounted for about $280 million, about two-thirds. Waterborne transport is often the least expensive method of transporting chemicals. Depending upon the product and the distance, the savings can be significant but can only be realized by shipping large volumes and/or long distances. As a result, waterborne transport is primarily used for commodity chemicals, such as basic and intermediate organic chemicals, basic inorganic chemicals, and fertilizers.

Other modes of transport accounted for about 48 million tons of chemical product shipments in 1992. This is mostly pipeline transportation of petrochemicals such as ethylene, usually for short distances. Some small volumes of consumer chemical products are shipped via air transportation.

Chart 10.1
Transportation of Chemical Products
By Mode, 1992



Source: CMA Analysis

TABLE 10.1
TRANSPORTATION OF CHEMICAL PRODUCTS BY CLASS I RAILROADS

	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Tons Originated (million tons):													
Total Freight	1484.9	1492.4	1268.6	1292.6	1429.4	1319.8	1305.8	1372.3	1429.5	1402.6	1424.9	1382.7	n/a
Chemicals & Allied Products	91.6	108.3	91.2	99.3	107.4	106.4	105.6	115.9	123.3	122.5	126.2	127.4	n/a
Freight Revenues (million dollars):													
Total Freight	11388	26938	26504	26710	29866	28225	28176	27657	29529	29328	29775	29319	n/a
Chemicals & Allied Products	1137	2946	2942	3078	3360	3342	3342	3477	3795	3788	3933	4070	n/a

Source: Association of American Railroads

Section 11
World Chemical Industries and Trade

The chemical industry is worldwide in scope. Virtually every nation has a chemical industry and is engaged in the foreign trade of chemical raw materials, industrial chemicals, or chemical products. The bulk of the world's estimated $1.27 trillion chemical output, however, is accounted for by a handful of industrialized nations: The top ten countries combined accounted for about 67 percent of total world chemical output in 1992. The United States alone produced $297 billion, about 23 percent of the total. The top ten chemical-producing countries in 1992 were: (in order:) the United States, Japan, Germany, France, Britain, Italy, Spain, Belgium + Luxembourg, the Netherlands, and Canada.

The chemical industries of these industrialized nations typically produce a wide variety of chemicals ranging from commodity industrial chemicals used to make other products, to specialty chemicals that are tailored for unique applications. Each of these countries has a large body of technological knowledge in research and process engineering, abundant capital and management skills, and skilled and technically competent labor forces. Many of these industrialized developed nations (Germany, United States, the Netherlands, Switzerland, France, and the United Kingdom) have historically maintained trade surpluses in chemicals. In 1991, Germany was the largest exporter ($51 billion), followed by the United States ($43 billion), France ($29 billion) and the United Kingdom ($25 billion). Japan exports a relatively small portion of its output.

The domestic chemical industries in developing nations generally make simple chemical products such as fertilizers and inorganic commodity chemicals. Some also produce minor volumes of specialty chemicals. Until the last decade, these developing nations were export markets for the chemical industries of the developed nations where there was little competition from domestic sources and these developing nations provided little or no competition in other markets. During the 1980s, however, many developing nations have embarked on ambitious programs to develop globally competitive chemical industries. This group includes several of the newly industrializing countries (NICs) of Asia such as Singapore, South Korea, Taiwan, and Thailand. Many of the larger economies of Latin America (Argentina, Brazil, Mexico and Venezuela) have also made large investments in their chemical industries.

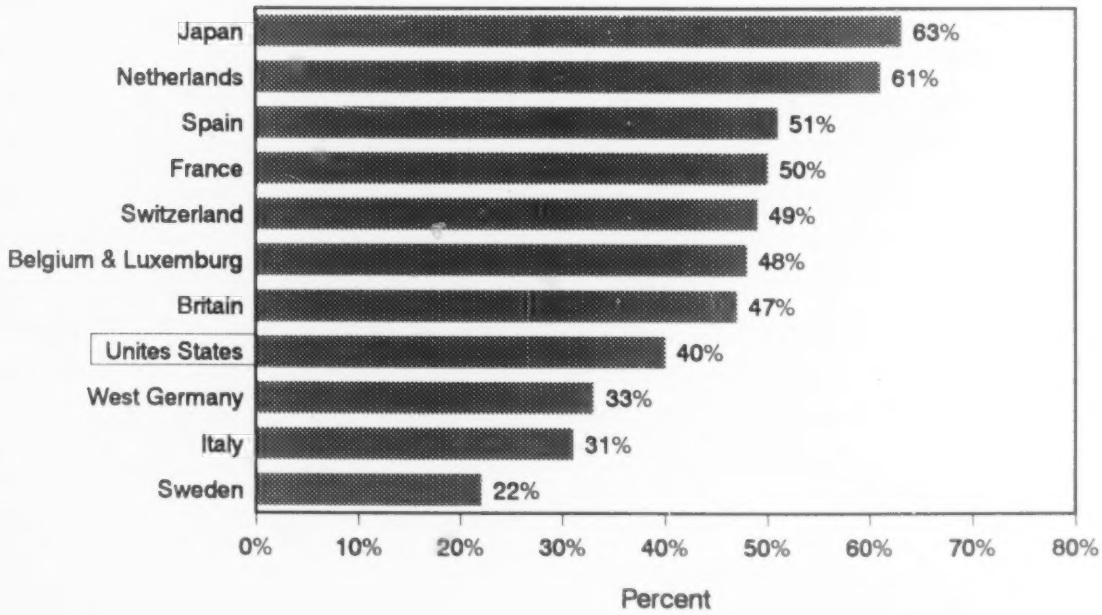
A major development beginning in the 1960s has been the globalization of the chemical industry -- investments by companies of many countries in production facilities in foreign countries, and the development of world markets, with prices of many chemicals set by global supply and demand. This was fostered by world economic growth, the reduction of tariffs and other trade barriers which promoted world trade, and advances in telecommunications and air transportation. This globalization of investments and markets has spread industry capital resources, technology, and managerial capabilities around the world and has resulted in the emergence of multinational chemical companies. Although a number of large companies had foreign subsidiaries for many years, international investment by American and Western European companies grew at a particularly rapid pace during the 1980's.

From 1982 to 1992, the U.S. chemical industry expanded its output by 40 percent. Of eleven OECD countries, however, the U.S. ranked only eighth in output growth:

Chart 11.1

Real Growth in Chemical-Industry Output

Selected Countries, 1982-1992



The figures shown above are from table 11.2, "Chemical Industry Production Indices." They are indexes of real growth, and thus account for the effects of inflation. Table 11.1, on the other hand, shows production figures in current dollars, so its percent changes are less reliable as indicators of real growth.

In terms of output, the U.S. chemical industry is the largest, followed by Japan, West Germany, France, and the United Kingdom. In terms of employees, the U.S. chemical industry is by far the largest, followed by West Germany, Japan, and the United Kingdom. U.S. chemical industry employment has been relatively stable during the past ten years.

Chart 11.2

World Chemical Industry: Employment and Ouput 1992

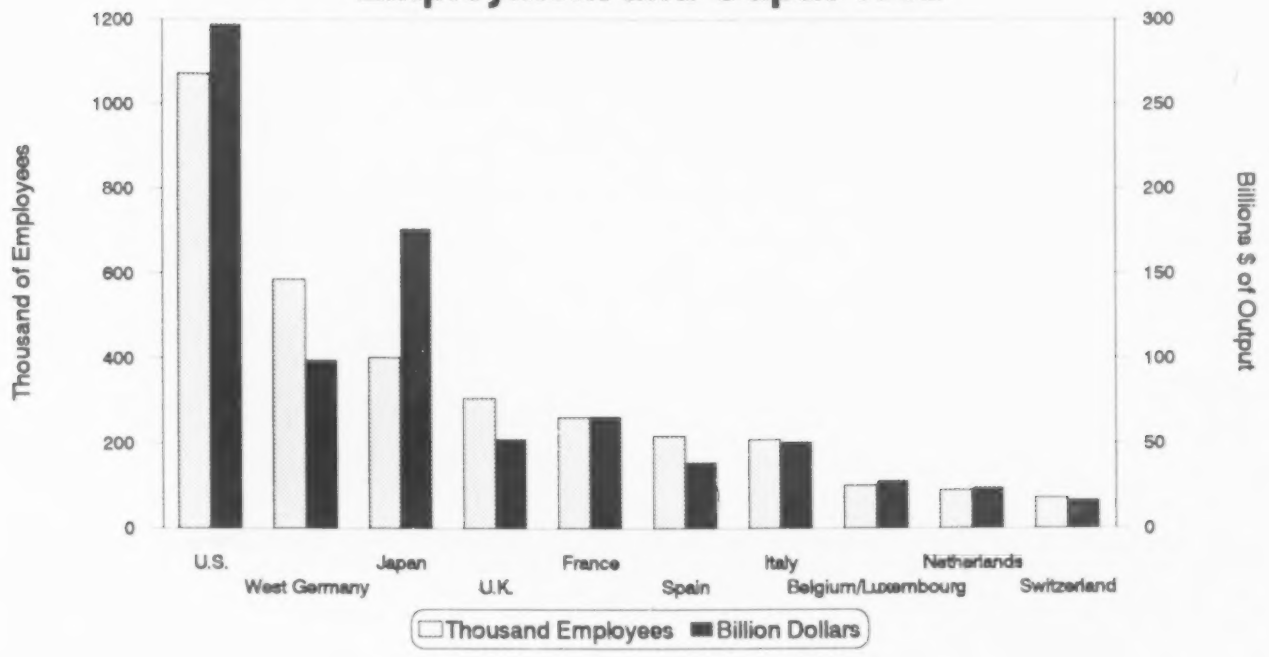


TABLE 11.1
WORLD CHEMICAL INDUSTRY OUTPUT (BILLION DOLLARS)

Item/Year	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates 1992/82	1992/87	1992/91
World Chemical Industry Output	171.0	719.0	681.0	702.0	719.0	720.0	850.0	976.0	1115.0	1173.0	1230.0	1245.0	1269.5	6.4%	5.4%	2.0%
United States	49.2	168.2	176.3	189.6	206.0	204.8	205.7	229.5	259.7	278.1	288.2	289.0	297.1	5.4%	5.3%	2.8%
Canada	2.5	9.6	11.6	12.6	13.1	13.4	13.4	15.0	17.8	19.5	19.7	19.1	19.0	5.1%	4.8%	-0.5%
Belgium/Luxembourg	1.7	16.6	14.1	13.2	13.6	14.1	17.2	19.8	22.7	23.4	28.1	27.9	28.0	7.1%	7.2%	0.4%
France	7.2	32.8	31.2	30.1	30.4	31.8	39.5	47.4	53.5	54.2	66.1	66.1	66.0	7.8%	6.8%	-0.2%
Germany	13.6	59.3	48.5	49.7	49.4	50.5		78.2	85.7	85.2	100.5	99.9	99.2	7.4%	4.9%	-0.7%
Italy	5.9	28.7	23.1	23.5	23.6	24.5	30.7	37.5	43.8	44.2	52.0	50.3	51.0	8.2%	6.3%	1.4%
Netherlands	2.4	14.4	12.5	13.1	13.6	13.9	16.0	19.5	22.4	22.4	25.3	24.3	24.0	6.7%	4.2%	-1.2%
Spain	n/a	17.8	15.7	14.1	15.2	16.1	20.7	25.8	30.4	32.5	39.8	38.4	38.9	9.5%	8.6%	1.3%
Sweden	n/a	4.5	3.9	3.9	4.1	4.1	5.0	6.3	7.5	7.3	8.4	7.8	7.8	7.2%	4.4%	0.0%
Switzerland	n/a	7.1	6.6	6.7	6.5	6.7	9.3	11.5	12.7	12.6	15.4	15.6	16.8	9.8%	7.9%	7.7%
United Kingdom	7.6	31.8	26.4	25.7	25.2	26.1	30.1	36.7	44.0	43.0	48.4	51.0	52.7	7.2%	7.5%	3.3%
Japan	15.3	79.5	74.1	81.0	84.9	85.9	113.9	134.3	160.2	160.8	161.5	183.3	176.5	9.1%	5.6%	-3.7%
Rest of the World	n/a	248.7	237.0	238.8	233.4	226.1	348.5	314.5	354.6	389.8	376.6	372.3	392.5	5.2%	4.5%	5.4%

Sources: Bureau of the Census, CEFIC, Chemical Industries Association (CIA), Statistics Canada, CMA estimates

TABLE 11.2
CHEMICAL INDUSTRY PRODUCTION INDICES, SELECTED COUNTRIES (1985=100)

Country/Year	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates 1992/82	1992/87	1992/91
United States	61.2	96.1	89.5	95.7	100.0	100.0	103.5	109.4	115.9	119.5	122.2	121.8	125.8	3.5%	2.8%	3.3%
Belgium/Luxembourg	51.2	84.5	96.9	90.6	97.0	100.0	102.6	110.6	120.2	124.9	132.3	130.0	143.3	4.0%	5.3%	10.2%
France	53.0	86.0	86.4	93.5	98.3	100.0	101.0	104.1	111.4	118.2	120.3	122.9	129.7	4.1%	4.5%	5.5%
Italy	53.6	91.2	88.1	91.2	96.8	100.0	101.4	103.6	112.5	115.0	117.1	115.8	115.5	2.7%	2.2%	-0.3%
Netherlands	42.2	75.2	75.6	82.9	91.7	100.0	100.0	104.0	112.0	118.0	120.0	120.0	122.0	4.9%	3.2%	1.7%
Spain	n/a	88.3	88.3	92.5	98.1	100.0	105.0	112.4	122.5	128.6	132.5	130.9	133.5	4.2%	3.5%	2.0%
Sweden	n/a	87.7	91.9	99.3	100.5	100.0	99.3	106.3	119.6	115.0	119.5	111.0	112.5	2.0%	1.1%	1.4%
Switzerland	n/a	81.4	83.8	89.2	94.1	100.0	102.1	105.3	109.4	119.0	119.6	120.6	124.9	4.1%	3.5%	3.6%
United Kingdom	67.1	83.3	83.8	90.3	95.8	100.0	101.7	109.0	114.4	119.5	118.3	121.7	123.6	4.0%	2.5%	1.6%
West Germany	64.1	91.3	87.4	93.6	98.5	100.0	99.2	101.0	106.5	109.4	112.4	114.8	116.0	2.9%	2.8%	1.0%
Japan	49.3	81.7	83.8	88.9	96.3	100.0	100.5	111.1	120.4	128.7	134.4	137.3	137.0	5.0%	4.3%	-0.2%

Sources: Federal Reserve Board, CEFIC, Chemical Industries Association

TABLE 11.3
CHEMICAL INDUSTRY PRICE INDICES, SELECTED COUNTRIES (1985=100)

Country/Year	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates 1992/82	1992/87	1992/91
United States	33.8	85.8	96.4	96.7	99.2	100.0	98.9	102.6	112.1	118.6	119.2	121.1	121.5	2.3%	3.4%	0.3%
Belgium/Luxembourg	43.3	69.0	86.9	92.2	96.5	100.0	97.7	94.0	96.5	102.1	98.8	98.1	97.5	1.2%	0.7%	-0.6%
France	25.9	65.2	81.0	87.7	95.6	100.0	98.8	96.3	98.8	103.2	103.2	103.3	100.2	2.1%	0.8%	-3.0%
Italy	17.2	62.6	77.7	84.5	92.8	100.0	97.3	100.4	107.5	110.7	117.5	120.4	120.2	4.5%	3.7%	-0.2%
Netherlands	44.4	81.3	92.7	93.5	94.3	100.0	85.4	87.0	88.0	92.0	89.0	87.0	82.0	-1.2%	-1.2%	-5.7%
Spain	n/a	56.6	74.1	83.4	91.7	100.0	101.0	102.5	104.6	108.3	112.1	112.8	112.0	4.2%	1.8%	-0.7%
Sweden	n/a	64.3	77.4	87.1	94.5	100.0	101.6	103.2	110.5	116.0	118.0	122.3	120.0	4.5%	3.1%	-1.9%
Switzerland	n/a	87.9	93.9	93.5	95.9	100.0	97.3	90.8	91.9	93.0	97.9	97.9	98.1	0.4%	1.6%	0.2%
United Kingdom	22.0	76.0	86.2	90.5	95.1	100.0	101.7	105.8	111.5	116.4	121.7	126.5	128.6	4.1%	4.0%	1.7%
West Germany	53.3	82.5	93.7	93.9	97.4	100.0	94.2	91.1	92.4	95.2	93.8	93.2	91.4	-0.2%	0.1%	-1.9%
Japan	50.3	107.9	104.5	102.5	101.4	100.0	93.5	90.1	89.9	91.4	92.5	95.8	90.0	-1.5%	0.0%	-6.1%

Sources: Bureau of Labor Statistics, CEFIC, Chemical Industries Association, CMA estimates

TABLE 11.4
CHEMICAL INDUSTRY EMPLOYMENT, SELECTED COUNTRIES (THOUSAND EMPLOYEES)

Country/Year	1970	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Annual Growth Rates 1992/82	1992/87	1992/91
United States	1049	1107	1075	1043	1049	1044	1022	1026	1059	1076	1088	1072	1071	0.0%	0.9%	-0.1%
Belgium/Luxembourg	83	90	88	88	89	90	91	91	92	95	97	99	99	1.2%	1.7%	0.0%
France	310	297	280	275	274	272	269	268	257	264	263	264	260	-0.7%	-0.6%	-1.5%
Italy	299	283	263	251	241	233	230	225	222	220	217	215	208	-2.3%	-1.6%	-3.3%
Netherlands	97	91	90	88	89	89	91	91	92	92	93	92	88	-0.2%	-0.7%	-4.3%
Spain	n/a	244	243	242	241	240	239	239	239	240	240	225	216	-1.2%	-2.0%	-4.0%
Sweden	n/a	39	44	43	44	43	42	45	43	42	42	40	40	-0.9%	-2.3%	0.0%
Switzerland	n/a	63	68	68	65	67	68	69	70	72	73	72	71	0.4%	0.6%	-1.4%
United Kingdom	440	420	367	345	343	339	328	320	324	329	325	307	305	-1.8%	-1.0%	-0.7%
West Germany	590	568	559	549	550	557	567	572	575	582	592	594	585	0.5%	0.5%	-1.5%
Japan	456	410	405	402	396	395	396	392	391	393	401	408	400	-0.1%	0.4%	-2.0%

Sources: Bureau of Labor Statistics, CEFIC, Chemical Industries Association, CMA estimates

World trade has been growing rapidly, 6.9 percent annually, from 1981 to 1991.

TABLE 11.5
WORLD EXPORTS BY PRODUCT COMPOSITION (BILLIONS OF DOLLARS)
All Countries

Item/Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Annual Growth 1981-91
All Commodities	1,664.4	1,556.2	1,529.9	1,630.9	1,676.9	1,855.9	2,197.8	2,571.9	2,757.3	3,202.8	3,244.5	6.9%
Non-Manufactures	650.5	581.8	548.1	563.9	551.7	491.7	549.2	592.2	647.0	754.5	735.5	1.2%
Manufactures	1,013.9	974.4	981.8	1,067.1	1,125.2	1,364.1	1,648.6	1,979.6	2,110.3	2,448.2	2,508.9	9.5%
Road Vehicles	125.9	123.7	127.6	140.7	156.6	195.1	231.2	255.2	263.3	306.6	313.8	9.6%
Chemicals	123.5	117.0	122.1	131.2	136.9	162.1	195.9	238.3	246.8	282.6	294.6	9.1%
Computers	28.8	30.6	37.9	48.8	53.7	66.5	84.9	104.4	110.3	125.3	132.8	16.5%
General Industrial Machinery	57.7	53.4	49.8	49.9	52.9	65.5	77.3	93.3	101.7	122.9	126.9	8.2%
Clothing	36.0	35.3	36.2	41.6	45.1	58.7	75.5	84.0	91.9	109.8	116.1	12.4%
Special Industrial Machinery	58.0	53.3	46.5	48.1	53.3	65.5	77.3	91.0	98.1	117.1	113.6	6.9%
Iron and Steel	64.5	59.5	52.1	57.2	60.2	63.7	70.0	91.3	98.1	103.3	99.9	4.5%
Other Transportation Equipment	46.5	45.8	43.4	43.3	42.9	45.6	53.4	70.8	77.5	104.5	114.0	9.4%

Source: CMA World Manufactures Trade Database

TABLE 11.6
WORLD EXPORTS BY PRODUCT COMPOSITION (PERCENT OF TOTAL)
All Countries

Item/Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Change 1981-91
All Commodities	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
Non-Manufactures	39.1%	37.4%	35.8%	34.6%	32.9%	26.5%	25.0%	23.0%	23.5%	23.6%	22.7%	-16.4%
Manufactures	60.9%	62.6%	64.2%	65.4%	67.1%	73.5%	75.0%	77.0%	76.5%	74.6%	77.3%	16.4%
Road Vehicles	7.6%	7.9%	8.3%	8.6%	9.3%	10.5%	10.5%	9.9%	9.5%	9.6%	9.7%	2.1%
Chemicals	7.4%	7.5%	8.0%	8.0%	8.2%	8.7%	8.9%	9.3%	9.0%	8.8%	9.1%	1.7%
Computers	1.7%	2.0%	2.5%	3.0%	3.2%	3.6%	3.9%	4.1%	4.0%	3.9%	4.1%	2.4%
General Industrial Machinery	3.5%	3.4%	3.3%	3.1%	3.2%	3.5%	3.5%	3.6%	3.7%	3.8%	3.9%	0.4%
Clothing	2.2%	2.3%	2.4%	2.5%	2.7%	3.2%	3.4%	3.3%	3.3%	3.4%	3.6%	1.4%
Special Industrial Machinery	3.5%	3.4%	3.0%	2.9%	3.2%	3.5%	3.5%	3.5%	3.6%	3.7%	3.5%	0.0%
Iron and Steel	3.9%	3.8%	3.4%	3.5%	3.6%	3.4%	3.2%	3.5%	3.6%	3.2%	3.1%	-0.8%
Other Transportation Equipment	2.8%	2.9%	2.8%	2.7%	2.6%	2.5%	2.4%	2.8%	2.8%	3.3%	3.5%	0.7%

Source: CMA World Manufactures Trade Database

TABLE 11.7
COUNTRY SHARES OF WORLD MANUFACTURES EXPORTS AND IMPORTS (%)
MANUFACTURES, SITC 5-9

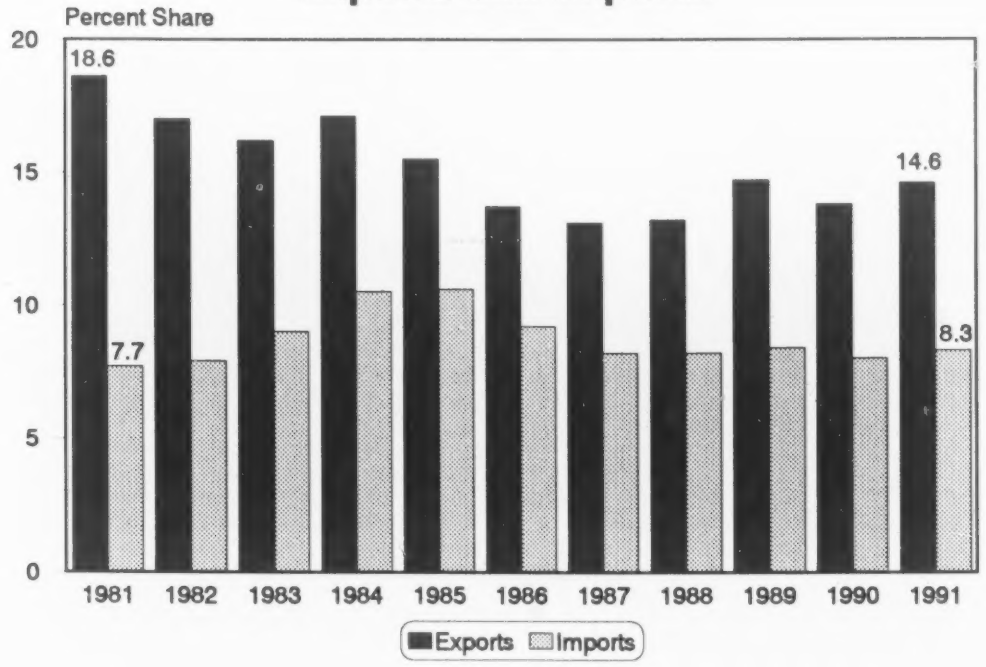
Country/Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Share Change 1981-91
Share of World Exports												
U.S.	16.0%	15.0%	14.1%	14.2%	13.8%	11.6%	11.6%	12.1%	13.0%	12.0%	12.9%	-3.2%
Canada	3.8%	3.9%	4.4%	4.9%	4.8%	4.2%	3.7%	3.6%	3.5%	3.2%	3.2%	-0.6%
Japan	14.6%	13.9%	14.6%	15.6%	15.3%	15.1%	13.7%	13.2%	12.8%	11.5%	12.3%	-2.3%
EC	46.9%	47.6%	46.3%	43.6%	44.2%	46.8%	47.3%	44.3%	44.4%	46.0%	45.4%	-1.5%
West Germany	15.2%	16.0%	15.3%	14.3%	14.7%	16.3%	16.4%	15.0%	14.8%	15.0%	14.7%	-0.5%
France	7.5%	7.2%	7.0%	6.6%	6.6%	6.8%	6.8%	6.4%	6.4%	6.8%	6.8%	-0.7%
Italy	6.3%	6.4%	6.4%	6.0%	6.0%	6.4%	6.3%	5.8%	6.0%	6.2%	6.1%	-0.2%
United Kingdom	6.9%	7.0%	6.4%	6.1%	6.2%	6.1%	6.3%	6.1%	6.1%	6.3%	6.2%	-0.7%
Other Western Europe	8.2%	8.2%	8.2%	7.7%	8.3%	8.8%	8.9%	8.5%	8.0%	9.0%	7.5%	-0.7%
Asian NICs *	4.2%	4.9%	5.5%	6.3%	6.0%	6.3%	7.1%	8.9%	8.5%	8.1%	7.6%	3.4%
EE - U.S.S.R.	1.1%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.1%	1.0%	1.1%	1.5%	0.4%
Developing Countries	5.1%	5.0%	5.6%	6.2%	6.2%	6.0%	6.4%	7.3%	7.6%	8.2%	7.9%	2.8%
Latin America	1.6%	1.7%	2.0%	2.3%	2.3%	2.0%	2.1%	2.4%	2.4%	2.3%	2.3%	0.7%
Rest of World	0.2%	0.3%	0.2%	0.2%	0.2%	0.2%	0.3%	1.0%	1.0%	1.1%	1.8%	1.6%
Share of World Imports												
U.S.	15.0%	15.5%	17.7%	21.9%	23.0%	21.6%	20.0%	18.5%	18.1%	16.1%	15.8%	0.8%
Canada	4.8%	4.2%	4.9%	5.6%	5.5%	4.9%	4.4%	4.6%	4.5%	3.9%	3.9%	-0.9%
Japan	3.0%	3.0%	3.2%	3.5%	3.2%	3.2%	3.7%	4.3%	4.7%	4.5%	4.5%	1.5%
EC	36.6%	36.8%	36.6%	34.3%	34.6%	38.3%	40.7%	39.7%	40.3%	42.5%	43.0%	6.4%
West Germany	9.0%	8.9%	9.2%	8.5%	8.4%	9.5%	9.9%	9.3%	9.4%	10.5%	11.8%	2.8%
France	6.5%	6.7%	6.3%	5.7%	5.7%	6.5%	6.9%	6.7%	6.7%	7.2%	6.9%	0.4%
Italy	3.8%	3.8%	3.6%	3.7%	3.8%	4.2%	4.6%	4.5%	4.6%	4.9%	4.9%	1.1%
United Kingdom	6.4%	6.7%	7.0%	6.6%	6.6%	6.7%	7.1%	7.5%	7.3%	7.1%	6.5%	0.1%
Other Western Europe	8.1%	8.0%	7.9%	7.4%	8.1%	9.0%	9.3%	8.7%	8.3%	9.4%	7.8%	-0.4%
Asian NICs *	3.8%	4.2%	4.5%	4.7%	4.1%	4.5%	5.0%	7.1%	7.6%	7.1%	7.3%	3.5%
EE - U.S.S.R.	2.5%	2.6%	2.6%	2.1%	2.1%	2.1%	1.9%	1.9%	1.7%	1.7%	2.1%	-0.4%
Developing Countries	24.1%	23.1%	20.4%	18.2%	17.1%	14.7%	13.1%	12.8%	12.4%	13.1%	12.8%	-11.3%
Latin America	6.6%	5.5%	4.0%	4.2%	4.1%	3.8%	3.5%	4.1%	3.4%	3.4%	3.8%	-2.8%
Rest of World	0.7%	1.0%	0.9%	0.8%	0.7%	0.6%	0.7%	1.3%	1.0%	1.1%	2.8%	2.1%

Source: CMA World Manufactures Trade Database
* Asian Newly Industrialized Countries = Hong Kong, Taiwan, South Korea, and Singapore

The U.S. share of world chemical exports declined during the 1980s. The U.S. share of world chemical imports rose in the mid-1980s, then fell back almost to its 1981 level:

Chart 11.3

U.S. Shares of World Chemical Exports and Imports



Source: CMA World Manufactures Trade Database

TABLE 11.8
WORLD CHEMICALS EXPORTS BY PRODUCT COMPOSITION (BILLION DOLLARS)
SITC 5 CHEMICALS AND RELATED PRODUCTS

Item/Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Annual Growth 1981-91
World Chemical Exports	123.5	117.0	122.1	131.2	136.9	162.1	195.9	238.3	246.8	282.6	294.6	9.1%
of which:												
51 Organic Chemicals	31.7	29.1	32.5	35.6	37.1	41.2	49.9	62.7	66.4	71.3	73.1	8.7%
52 Inorganic Chemicals	15.7	15.1	14.9	15.9	16.8	18.2	20.4	23.9	24.1	24.7	25.2	4.9%
53 Dyes, Tanning	7.2	7.0	7.2	7.3	7.7	10.2	12.8	15.1	15.9	19.0	19.2	10.3%
54 Medicinal, Pharmaceuticals	13.3	14.5	13.9	14.1	15.4	20.0	23.7	27.1	27.2	34.1	37.7	11.0%
55 Perfume, Cleaning	7.0	6.7	6.8	7.2	7.6	9.6	12.0	13.8	14.6	18.9	20.3	11.3%
56 Fertilizers, Manufacturing	7.1	5.9	6.1	7.2	7.4	7.4	8.4	10.1	9.7	10.8	10.9	4.4%
57 Explosives, Pyrotechnics	0.5	0.5	0.5	0.6	0.6	0.6	0.7	1.7	1.1	1.2	0.9	6.2%
58 Plastic Materials	24.7	23.8	25.6	27.7	28.1	35.6	45.0	56.4	59.4	69.1	71.6	11.2%
59 Chemical Materials NES	16.4	14.4	14.6	15.6	16.1	19.2	23.0	27.4	28.4	33.6	35.8	8.2%

Source: CMA World Manufactures Trade Database

TABLE 11.9
WORLD CHEMICALS EXPORTS BY PRODUCT COMPOSITION (PERCENT OF CHEMICAL EXPORTS)
SITC 5 CHEMICALS AND RELATED PRODUCTS

Item/Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Change 1981-91
World Chemical Exports	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
of which:												
51 Organic Chemicals	25.7%	24.9%	26.6%	27.1%	27.1%	25.4%	25.5%	26.3%	26.9%	25.2%	24.8%	-0.9%
52 Inorganic Chemicals	12.7%	12.9%	12.2%	12.1%	12.3%	11.2%	10.4%	10.0%	9.8%	8.7%	8.6%	-4.1%
53 Dyes, Tanning	5.8%	6.0%	5.9%	5.6%	5.6%	6.3%	6.5%	6.3%	6.5%	6.7%	6.5%	0.7%
54 Medicinal, Pharmaceuticals	10.8%	12.4%	11.4%	10.7%	11.2%	12.3%	12.1%	11.4%	11.0%	12.1%	12.8%	2.0%
55 Perfume, Cleaning	5.6%	5.7%	5.6%	5.5%	5.6%	5.9%	6.1%	5.8%	5.9%	6.7%	6.9%	1.3%
56 Fertilizers, Manufacturing	5.7%	5.0%	5.0%	5.5%	5.4%	4.6%	4.3%	4.2%	3.9%	3.8%	3.7%	-2.0%
57 Explosives, Pyrotechnics	0.4%	0.4%	0.4%	0.5%	0.4%	0.4%	0.4%	0.7%	0.4%	0.4%	0.3%	-0.1%
58 Plastic Materials	20.0%	20.3%	21.0%	21.1%	20.5%	22.0%	23.0%	23.7%	24.1%	24.4%	24.3%	4.3%
59 Chemical Materials NES	13.2%	12.3%	12.0%	11.9%	11.8%	11.8%	11.7%	11.5%	11.5%	11.9%	12.2%	-1.0%

Source: CMA World Manufactures Trade Database

TABLE 11.10
1981 WORLD CHEMICALS TRADE FLOWS (MILLION DOLLARS)
SITC 5 CHEMICALS AND RELATED PRODUCTS

				1981 EXPORTER							
Importer	World	US	Can.	Japan	EC	W Germ	France	U.K.	NICs	L Amer	Other
World	123,530	22,984	4,002	6,695	72,712	21,966	12,141	10,831	757	1,432	14,948
US	8,736		2,393	958	3,363	1,084	635	645	164	707	1,151
Canada	3,299	2,582		51	489	135	59	134	19	23	135
Japan	5,527	2,380	167		1,470	597	292	214	431	184	895
EC	56,284	5,619	759	710	40,512	11,344	6,741	5,443	85	466	8,133
W Germ	11,236	865	64	206	7,809		2,007	880	20	89	2,183
France	9,332	682	206	93	6,448	2,387		763	7	67	1,829
U.K.	6,596	747	136	110	4,714	1,359	1,050		18	65	806
Asian NICs *	5,464	1,988	131	1,835	1,287	432	154	305	0	0	223
L Amer	8,780	4,899	177	244	2,941	1,043	510	397	0		519
Other	35,440	5,516	375	2,897	22,650	7,331	3,750	3,693	58	52	3,892

Source: CMA World Manufactures Trade Database

TABLE 11.11
1991 WORLD CHEMICALS TRADE FLOWS (MILLION DOLLARS)
SITC 5 CHEMICALS AND RELATED PRODUCTS

				1991 EXPORTER							
Importer	World	US	Can.	Japan	EC	W Germ	France	U.K.	NICs	L Amer	Other
World	294,645	42,903	6,704	17,295	169,175	50,999	28,875	25,176	8,435	3,983	46,149
US	23,949		4,564	2,768	9,958	3,307	1,590	2,127	1,146	1,954	3,558
Canada	8,324	6,592		104	1,157	350	185	317	73	61	337
Japan	14,779	5,053	314		4,827	2,017	916	672	1,134	311	3,139
EC	141,850	11,223	446	3,051	99,487	26,939	17,773	12,999	947	1,129	25,567
W Germ	29,625	1,902	75	852	19,910		4,842	2,795	166	280	6,440
France	22,204	1,108	50	341	16,513	6,011		2,452	108	183	3,901
U.K.	20,624	1,579	81	378	12,279	3,775	2,907		238	96	5,972
Asian NICs *	22,470	5,158	422	6,377	4,885	1,675	816	906	2,794	307	2,527
L Amer	13,030	7,028	153	295	4,494	1,442	1,042	655	112		948
Other	70,243	7,850	804	4,699	44,367	15,269	6,553	7,500	2,229	221	10,072

Source: CMA World Manufactures Trade Database
* Asian Newly Industrialized Countries = Hong Kong, Taiwan, South Korea, and Singapore

TABLE 11.12
COUNTRY SHARES OF WORLD CHEMICAL EXPORTS AND IMPORTS (% OF TOTAL)
SITC 5 CHEMICALS AND RELATED PRODUCTS

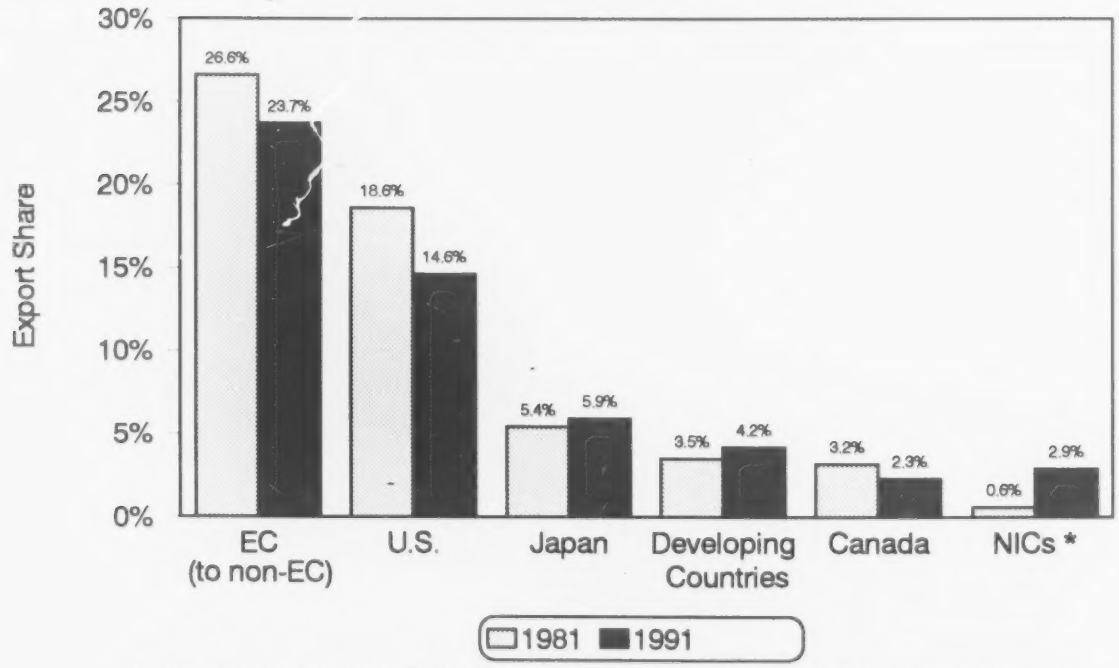
Country/Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Share Change 1981-91
Share of World Exports:												
United States	18.6%	17.0%	16.2%	17.1%	15.5%	13.7%	13.1%	13.2%	14.7%	13.8%	14.6%	-4.0%
Canada	3.2%	2.9%	3.0%	3.2%	3.0%	2.5%	2.4%	2.6%	2.6%	2.4%	2.3%	-0.9%
Japan	5.4%	5.3%	5.6%	5.7%	5.5%	5.8%	5.9%	5.8%	5.9%	5.6%	5.9%	0.5%
EC	57.6%	59.3%	59.0%	57.7%	58.8%	60.4%	61.1%	59.3%	58.4%	58.7%	57.4%	-0.2%
To External	26.6%	26.8%	27.1%	26.8%	27.1%	26.4%	25.8%	25.1%	24.5%	23.6%	23.7%	-3.0%
West Germany	17.8%	18.1%	18.2%	17.8%	17.7%	19.3%	19.5%	18.3%	17.8%	17.8%	17.3%	-0.5%
France	9.8%	10.0%	9.7%	9.6%	10.0%	10.3%	10.4%	9.9%	9.7%	10.0%	9.8%	0.0%
Italy	4.2%	4.5%	5.0%	4.7%	4.8%	4.4%	4.5%	4.3%	4.4%	3.9%	3.8%	-0.4%
United Kingdom	8.8%	9.1%	8.6%	8.4%	8.9%	8.8%	8.8%	8.5%	8.2%	8.4%	8.5%	-0.3%
Other Western Europe	8.6%	8.7%	8.9%	8.4%	8.7%	9.6%	9.9%	9.6%	8.8%	10.1%	8.9%	0.3%
Asian NICs *	0.6%	0.9%	1.0%	1.2%	1.2%	1.3%	1.4%	2.3%	2.5%	2.7%	2.9%	2.3%
EE - U.S.S.R.	1.9%	1.7%	1.8%	1.8%	2.0%	1.7%	1.5%	1.8%	1.4%	1.6%	1.6%	-0.3%
Developing Countries	3.5%	3.5%	4.1%	4.5%	5.0%	4.5%	4.3%	5.1%	5.0%	5.1%	4.2%	0.7%
Latin America	1.2%	1.2%	1.6%	1.9%	1.9%	1.4%	1.2%	1.4%	1.5%	1.4%	1.4%	0.2%
Rest of World	0.3%	0.3%	0.2%	0.2%	0.2%	0.3%	0.2%	0.4%	0.5%	0.4%	2.2%	1.9%
Share of World Imports:												
United States	7.7%	7.9%	9.0%	10.5%	10.6%	9.2%	8.2%	8.2%	8.4%	8.0%	8.3%	0.6%
Canada	2.8%	2.7%	3.3%	3.4%	3.1%	2.8%	2.6%	2.7%	2.8%	2.6%	2.7%	-0.1%
Japan	4.9%	5.4%	5.6%	6.0%	5.6%	5.6%	5.6%	5.7%	5.8%	5.1%	5.5%	0.6%
EC	43.5%	44.2%	43.7%	42.5%	43.4%	46.3%	47.5%	45.3%	46.0%	47.6%	47.4%	3.9%
From External	12.5%	12.4%	12.4%	12.1%	12.4%	12.8%	12.9%	12.3%	12.7%	13.0%	14.2%	1.7%
West Germany	9.7%	10.0%	10.0%	9.7%	9.9%	10.5%	10.6%	9.8%	9.8%	10.4%	10.7%	1.0%
France	8.2%	8.0%	7.7%	7.4%	7.6%	8.1%	8.3%	7.9%	8.0%	8.4%	8.0%	-0.2%
Italy	5.6%	5.8%	5.9%	5.8%	6.0%	6.5%	6.7%	6.5%	6.6%	6.7%	6.6%	1.0%
United Kingdom	5.8%	6.1%	6.2%	6.3%	6.2%	6.4%	6.7%	6.7%	6.6%	6.5%	6.6%	0.8%
Other Western Europe	8.8%	9.1%	9.0%	8.3%	9.5%	9.9%	10.1%	9.8%	8.9%	10.4%	8.5%	-0.3%
Asian NICs *	4.3%	4.6%	4.9%	5.1%	4.6%	5.3%	5.8%	8.4%	9.0%	8.2%	8.3%	4.0%
EE - U.S.S.R	4.0%	3.7%	3.3%	3.1%	3.3%	3.1%	3.1%	2.9%	2.7%	2.4%	2.7%	-1.3%
Developing Countries	22.6%	21.0%	19.8%	19.3%	18.1%	16.2%	15.4%	15.1%	14.2%	14.6%	13.5%	-9.1%
Latin America	7.0%	6.3%	5.4%	5.6%	5.3%	5.0%	4.5%	4.1%	4.2%	3.9%	4.3%	-2.7%
Rest of World	0.2%	0.3%	0.3%	0.4%	0.4%	0.4%	0.3%	1.4%	1.1%	1.1%	3.2%	3.0%

Source: CMA World Manufactures Trade Database
* Asian Newly Industrialized Countries = Hong Kong, Taiwan, South Korea, and Singapore

The U.S. share of world chemical exports declined by 4 percentage points over 1981-1991. Export share lost by the U.S. has gone mostly to the Asian NICs and to developing countries:

Chart 11.4

Chemical Export Shares



* Asian Newly Industrialized Countries = Hong Kong, Taiwan, South Korea, and Singapore

TABLE 11.13
U.S. SHARE OF WORLD CHEMICAL IMPORTS AND EXPORTS (%)

Item/Year		1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Share Change 1981-91
Chemicals and Rel. Prod.	Export Share	18.6%	17.0%	16.2%	17.1%	15.5%	13.7%	13.1%	13.2%	14.7%	13.8%	14.6%	-4.0%
SITC 5	Import Share	7.7%	7.9%	9.0%	10.5%	10.6%	9.2%	8.2%	8.2%	8.4%	8.0%	8.3%	0.6%
	Share Balance	10.9%	9.1%	7.1%	6.5%	4.9%	4.5%	4.9%	5.0%	6.3%	5.8%	6.3%	-4.6%
Organic Chemicals	Export Share	16.3%	16.1%	14.0%	14.7%	14.0%	13.2%	13.3%	13.5%	16.0%	14.6%	14.6%	-1.7%
SITC 51	Import Share	9.1%	9.0%	10.6%	11.7%	12.0%	9.7%	8.8%	8.7%	10.4%	10.1%	11.0%	1.9%
	Share Balance	7.2%	7.1%	3.4%	3.0%	2.0%	3.5%	4.5%	4.8%	5.6%	4.5%	3.6%	-3.6%
Inorganic Chemicals	Export Share	20.4%	20.6%	20.5%	22.7%	19.6%	16.9%	15.3%	15.0%	17.9%	15.5%	16.3%	-4.1%
SITC 52	Import Share	13.8%	15.4%	16.5%	19.7%	18.7%	17.1%	14.0%	14.4%	14.2%	13.7%	13.7%	-0.1%
	Share Balance	6.6%	5.2%	4.0%	3.0%	0.9%	-0.2%	1.3%	0.5%	3.7%	1.8%	2.6%	-4.0%
Dyes & Tanning	Export Share	7.5%	7.2%	7.1%	6.9%	6.1%	5.1%	5.0%	4.8%	6.7%	8.2%	8.4%	0.9%
SITC 53	Import Share	4.9%	4.8%	6.5%	8.3%	8.1%	8.1%	8.1%	6.7%	6.7%	6.4%	7.3%	2.4%
	Share Balance	2.6%	2.4%	0.6%	-1.4%	-2.0%	-3.0%	-3.1%	-1.9%	0.0%	1.8%	1.1%	-1.5%
Medicinal, Pharm. Prod.	Export Share	16.9%	16.3%	18.6%	19.3%	18.1%	16.1%	14.1%	15.1%	13.1%	11.7%	11.8%	-5.1%
SITC 54	Import Share	6.8%	6.7%	8.3%	10.3%	10.9%	10.2%	10.2%	11.4%	7.4%	7.0%	7.7%	0.9%
	Share Balance	10.1%	9.6%	10.2%	9.0%	7.3%	5.9%	3.9%	3.7%	5.7%	4.7%	4.1%	-6.0%
Perfume, Cleaning, ETC.	Export Share	14.1%	13.3%	12.5%	12.1%	10.8%	9.0%	8.5%	8.7%	10.1%	10.4%	11.6%	-2.5%
SITC 55	Import Share	5.7%	5.9%	7.4%	9.6%	10.5%	10.0%	9.0%	9.2%	7.9%	7.1%	7.1%	1.4%
	Share Balance	8.4%	7.4%	5.1%	2.5%	0.3%	-1.0%	-0.5%	-0.5%	2.2%	3.3%	4.5%	-3.9%
Fertilizers, Manufactured	Export Share	24.5%	23.5%	20.9%	25.3%	29.0%	26.1%	27.0%	24.8%	29.2%	23.9%	27.4%	2.9%
SITC 56	Import Share	16.5%	16.4%	16.9%	16.7%	13.8%	12.6%	10.3%	10.9%	11.5%	10.2%	9.3%	-7.2%
	Share Balance	8.0%	7.1%	4.0%	8.6%	15.2%	13.5%	16.7%	13.9%	17.7%	13.7%	18.1%	10.1%
Explosives	Export Share	18.3%	19.0%	17.7%	24.1%	16.9%	12.6%	13.6%	5.3%	11.6%	11.8%	17.8%	-0.5%
SITC 57	Import Share	12.2%	7.3%	13.5%	14.6%	17.3%	17.3%	16.0%	5.0%	14.9%	13.4%	17.8%	5.6%
	Share Balance	6.1%	11.7%	4.2%	9.5%	-0.4%	-4.7%	-2.4%	0.3%	-3.3%	-1.6%	0.0%	-6.1%
Plastic Materials	Export Share	15.2%	15.2%	14.4%	14.5%	11.4%	10.3%	10.4%	11.0%	13.4%	13.2%	14.5%	-0.7%
SITC 58	Import Share	3.1%	3.1%	4.3%	5.4%	5.6%	5.0%	4.3%	4.2%	5.7%	5.5%	5.5%	2.4%
	Share Balance	12.1%	12.1%	10.1%	9.2%	5.9%	5.3%	6.1%	6.8%	7.7%	7.7%	9.0%	-3.1%
Chemical Materials NES	Export Share	32.2%	22.7%	21.7%	22.2%	20.1%	17.9%	16.7%	16.5%	15.7%	15.9%	16.5%	-15.7%
SITC 59	Import Share	5.2%	5.5%	5.5%	6.1%	6.8%	6.1%	6.2%	6.2%	5.7%	5.6%	5.5%	0.3%
	Share Balance	27.0%	17.3%	16.2%	16.2%	13.2%	11.8%	10.6%	10.3%	10.0%	10.3%	10.9%	-16.1%

* "Share Balance"= Export share minus import share.

TABLE 11.14
1981 WORLD CHEMICALS TRADE FLOWS (MILLION DOLLARS)
SITC 51 ORGANIC CHEMICALS

				1981 EXPORTER							
Importer	World	US	Can.	Japan	EC	W Germ	France	U.K.	NICs	L Amer	Other
World	31,690	5,170	1,002	2,184	19,118	5,758	2,889	2,920	241	519	3,975
US	2,689		537	365	1,256	382	173	243	47	195	484
Canada	810	546		15	184	42	19	30	5	13	60
Japan	1,654	634	81		416	155	54	52	138	131	385
EC	16,230	1,464	301	336	11,918	3,190	1,904	1,922	39	157	2,172
W Germ	3,082	78	6	101	2,376		589	348	9	19	512
France	1,970	60	12	42	1,475	515		228	4	25	377
U.K.	1,771	132	11	45	1,331	400	267		4	12	248
Asian NICs *	1,667	576	17	654	377	103	37	53	0	0	43
L Amer	2,253	1,225	31	81	726	295	115	88	0		190
Other	6,387	725	35	733	4,241	1,591	587	532	12	23	641

Source: CMA World Manufactures Trade Database

TABLE 11.15
1991 WORLD CHEMICALS TRADE FLOWS (MILLION DOLLARS)
SITC 51 ORGANIC CHEMICALS

				1991 EXPORTER							
Importer	World	US	Can.	Japan	EC	W Germ	France	U.K.	NICs	L Amer	Other
World	73,129	10,937	1,391	6,193	39,272	10,908	6,196	6,843	2,319	1,770	11,248
US	8,022		792	1,007	3,605	1,102	446	776	543	940	1,134
Canada	1,531	1,089		33	281	76	47	72	21	34	73
Japan	4,393	1,182	205		1,355	498	166	180	336	153	1,162
EC	34,916	3,295	126	1,324	23,288	6,009	3,989	3,851	434	349	6,100
W Germ	6,795	488	3	315	4,573		1,026	838	85	89	1,243
France	4,604	205	1	121	3,254	1,094		723	62	61	900
U.K.	4,883	361	7	173	2,588	672	665		152	11	1,592
Asian NICs *	7,280	1,981	184	2,203	1,241	341	157	204	480	229	963
L Amer	3,544	1,832	9	122	1,245	421	241	160	35		301
Other	13,444	1,558	75	1,503	8,258	2,462	1,148	1,600	470	65	1,515

Source: CMA World Manufactures Trade Database
* Asian Newly Industrialized Countries = Hong Kong, Taiwan, South Korea, and Singapore

TABLE 11.16
COUNTRY SHARES OF WORLD CHEMICALS EXPORTS AND IMPORTS (%)
SITC 51 ORGANIC CHEMICALS

Country/Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Share Change 1981-91
Share of World Exports												
U.S.	16.3%	16.1%	14.0%	14.7%	14.0%	13.2%	13.3%	13.5%	16.0%	14.6%	14.6%	-1.7%
Canada	3.2%	3.1%	3.1%	2.9%	2.7%	2.0%	2.1%	2.3%	2.2%	2.1%	1.9%	-1.3%
Japan	6.9%	7.0%	6.7%	6.7%	6.8%	7.6%	8.1%	7.8%	8.2%	7.9%	8.5%	1.6%
EC	59.7%	59.0%	60.8%	59.7%	58.9%	59.1%	59.3%	57.1%	54.8%	54.9%	53.7%	-6.0%
To External	23.2%	23.2%	25.0%	25.0%	24.5%	24.3%	23.9%	23.3%	22.0%	21.4%	21.9%	-1.4%
West Germany	18.2%	18.9%	18.4%	18.0%	17.5%	18.2%	17.9%	16.7%	15.6%	15.5%	14.9%	-3.3%
France	9.1%	5.6%	8.8%	8.8%	8.8%	9.3%	9.5%	8.7%	8.5%	8.8%	8.5%	-0.6%
Italy	3.4%	4.6%	5.2%	5.1%	4.7%	4.0%	4.5%	3.9%	4.0%	3.3%	3.1%	-0.4%
United Kingdom	9.2%	9.5%	9.0%	9.0%	9.6%	9.2%	9.3%	8.9%	8.3%	8.4%	9.4%	0.2%
Other Western Europe	7.7%	8.4%	7.8%	7.2%	7.5%	8.6%	8.5%	8.1%	7.5%	8.6%	7.3%	-0.4%
Asian NICs *	0.8%	0.8%	1.0%	1.5%	1.3%	1.4%	1.4%	2.1%	2.1%	3.0%	3.2%	2.4%
EE - U.S.S.R.	2.0%	1.9%	1.9%	1.9%	2.3%	2.1%	1.8%	2.3%	1.8%	1.8%	1.9%	-0.1%
Developing Countries	3.5%	3.6%	4.7%	5.4%	6.3%	5.7%	5.3%	6.4%	6.9%	6.7%	6.3%	2.8%
Latin America	1.8%	1.7%	2.8%	3.3%	3.4%	2.1%	1.7%	1.9%	2.4%	2.3%	2.4%	0.6%
Rest of World	0.1%	0.1%	0.2%	0.3%	0.3%	0.5%	0.4%	0.6%	0.7%	0.8%	2.7%	2.6%
Share of World Imports												
U.S.	9.1%	9.0%	10.6%	11.7%	12.0%	9.7%	8.8%	8.7%	10.4%	10.1%	11.0%	1.9%
Canada	2.5%	2.3%	2.7%	2.8%	2.7%	2.5%	2.3%	2.1%	2.1%	2.1%	2.0%	-0.5%
Japan	5.7%	5.7%	6.4%	6.6%	6.3%	6.7%	6.8%	7.0%	6.7%	5.9%	6.5%	0.8%
EC	50.0%	50.2%	47.4%	46.0%	46.4%	48.0%	48.5%	44.9%	45.4%	47.0%	46.7%	-3.3%
To External	13.2%	13.3%	12.5%	12.9%	13.2%	13.6%	13.2%	12.4%	13.1%	13.8%	14.9%	1.7%
West Germany	11.3%	11.1%	10.7%	10.2%	10.5%	10.7%	10.8%	9.5%	10.0%	10.4%	10.5%	-0.8%
France	7.7%	7.9%	7.4%	7.1%	7.1%	7.4%	7.8%	7.0%	6.9%	7.6%	7.0%	-0.7%
Italy	6.4%	6.9%	6.5%	6.5%	6.9%	7.4%	7.1%	6.5%	6.8%	6.9%	6.5%	0.1%
United Kingdom	6.6%	6.7%	6.7%	6.9%	6.4%	6.3%	6.5%	6.3%	6.1%	6.1%	7.0%	0.4%
Other Western Europe	7.5%	7.9%	7.3%	6.8%	8.0%	8.1%	8.0%	8.0%	6.9%	8.4%	6.5%	-1.0%
Asian NICs *	5.1%	5.8%	6.2%	6.5%	6.1%	7.5%	8.5%	12.5%	13.0%	11.6%	11.0%	5.9%
EE - U.S.S.R.	3.5%	3.0%	2.8%	2.7%	2.8%	2.7%	2.8%	2.4%	2.3%	1.7%	1.8%	-1.7%
Developing Countries	15.7%	15.1%	15.6%	15.5%	14.5%	13.7%	13.1%	12.6%	11.7%	12.7%	11.4%	-4.3%
Latin America	6.9%	6.4%	5.7%	6.4%	6.0%	5.7%	5.2%	4.4%	4.4%	4.5%	4.6%	-2.3%
Rest of World	0.1%	0.3%	0.3%	0.4%	0.4%	0.4%	0.4%	1.6%	0.9%	0.9%	3.1%	3.0%

Source: CMA World Manufactures Trade Database
* Asian Newly Industrialized Countries = Hong Kong, Taiwan, South Korea, and Singapore

TABLE 11.17
1981 WORLD CHEMICALS TRADE FLOWS (MILLION DOLLARS)
SITC 52 INORGANIC CHEMICALS

				1981 EXPORTER							
Importer	World	US	Can.	Japan	EC	W Germ	France	U.K.	NICs	L Amer	Other
World	15,683	3,200	1,147	660	7,249	1,972	1,880	1,145	58	424	3,369
US	1,925		732	96	534	163	183	127	6	273	557
Canada	390	320		7	40	12	7	16	1	2	22
Japan	952	530	13		210	56	107	17	36	16	163
EC	7,124	915	334	66	3,695	999	980	628	9	129	2,105
W Germ	1,449	327	39	19	616		229	66	2	14	446
France	1,755	181	179	12	485	211		94	1	18	897
U.K.	958	117	103	18	568	130	269		3	14	149
Asian NICs *	395	87	2	150	130	46	10	57	0	0	26
L Amer	1,082	654	11	20	389	80	31	33	0		8
Other	3,815	694	55	321	2,251	616	562	267	6	4	488

Source: CMA World Manufactures Trade Database

TABLE 11.18
1991 WORLD CHEMICALS TRADE FLOWS (MILLION DOLLARS)
SITC 52 INORGANIC CHEMICALS

				1991 EXPORTER							
Importer	World	US	Can.	Japan	EC	W Germ	France	U.K.	NICs	L Amer	Other
World	25,198	4,102	1,282	1,169	12,349	3,627	3,078	1,838	335	716	5,245
US	3,190		1,061	161	1,012	491	268	88	15	427	513
Canada	604	489		12	55	20	10	16	2	5	43
Japan	2,317	1,130	22		532	129	342	25	99	82	453
EC	10,929	795	107	128	6,671	1,750	1,920	590	25	155	3,049
W Germ	2,011	239	18	29	1,151		301	108	3	57	515
France	1,947	67	32	28	1,023	409		98	0	35	762
U.K.	2,425	133	37	22	1,142	369	409		8	14	1,070
Asian NICs *	1,625	343	21	449	394	146	91	108	66	26	325
L Amer	1,092	785	6	27	258	95	31	27	3		13
Other	5,440	561	64	393	3,427	995	416	984	126	21	848

Source: CMA World Manufactures Trade Database
* Asian Newly Industrialized Countries = Hong Kong, Taiwan, South Korea, and Singapore

TABLE 11.19
COUNTRY SHARES OF WORLD CHEMICAL EXPORTS AND IMPORTS (%)
SITC 52 INORGANIC CHEMICALS

Country/Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Share Change 1981-91
Share of World Exports												
U.S.	20.4%	20.6%	20.5%	22.7%	19.6%	16.9%	15.3%	15.0%	17.9%	15.5%	16.3%	-4.1%
Canada	7.3%	6.0%	6.0%	6.9%	6.5%	6.4%	5.9%	6.0%	7.4%	5.4%	5.1%	-2.2%
Japan	4.2%	4.1%	4.3%	3.8%	3.7%	3.9%	4.3%	4.4%	4.6%	4.6%	4.6%	0.4%
EC	45.0%	47.8%	46.4%	44.5%	48.5%	51.4%	52.2%	50.2%	47.1%	50.3%	49.0%	4.0%
To External	22.8%	23.0%	23.8%	22.0%	23.6%	22.3%	22.6%	23.5%	21.5%	21.8%	22.5%	-0.3%
West Germany	12.6%	13.3%	12.9%	13.2%	12.4%	14.0%	14.6%	13.1%	13.8%	14.6%	14.4%	1.8%
France	12.0%	12.4%	11.0%	11.2%	14.0%	14.8%	15.2%	13.6%	10.9%	12.6%	12.2%	0.2%
Italy	4.7%	5.1%	6.2%	3.5%	4.0%	2.7%	2.5%	2.4%	2.6%	2.1%	2.2%	-2.5%
United Kingdom	7.3%	8.1%	7.1%	6.8%	7.5%	9.0%	8.9%	8.3%	6.9%	6.9%	7.3%	0.0%
Other Western Europe	4.7%	4.5%	4.9%	5.1%	5.4%	5.5%	6.0%	5.9%	5.6%	6.3%	4.9%	0.2%
Asian NICs *	0.4%	0.6%	0.6%	0.7%	0.6%	0.7%	0.7%	1.2%	1.4%	1.6%	1.3%	0.9%
EE - U.S.S.R.	6.0%	4.6%	4.9%	4.8%	4.6%	4.2%	4.4%	4.9%	3.4%	4.6%	4.2%	-1.8%
Developing Countries	10.4%	10.3%	11.3%	11.4%	10.9%	10.6%	10.9%	11.8%	11.6%	11.6%	9.4%	-1.0%
Latin America	2.7%	2.9%	3.1%	3.4%	2.8%	2.2%	2.0%	2.5%	3.2%	3.1%	2.8%	0.1%
Rest of World	1.5%	1.6%	1.0%	0.1%	0.2%	0.5%	0.5%	1.0%	1.1%	0.6%	5.2%	3.7%
Share of World Imports												
U.S.	13.8%	15.4%	16.5%	19.7%	18.7%	17.1%	14.0%	14.4%	14.2%	13.7%	13.7%	-0.1%
Canada	2.2%	2.0%	2.3%	2.3%	2.2%	2.0%	1.9%	2.3%	2.7%	2.5%	2.3%	0.1%
Japan	6.3%	8.4%	9.4%	11.2%	9.6%	8.9%	9.1%	9.4%	10.2%	9.6%	10.3%	4.0%
EC	44.1%	40.5%	39.7%	38.6%	40.8%	44.6%	45.8%	41.9%	41.1%	41.5%	40.6%	-3.5%
To External	20.7%	18.2%	19.1%	17.1%	17.1%	17.7%	19.2%	17.9%	17.0%	15.1%	17.2%	-3.5%
West Germany	10.3%	10.9%	10.5%	10.6%	10.9%	11.2%	11.1%	10.4%	9.4%	9.6%	8.7%	-1.6%
France	13.1%	9.3%	8.9%	8.8%	9.2%	10.3%	10.1%	9.4%	8.4%	8.3%	8.3%	-4.8%
Italy	4.6%	3.7%	4.6%	3.4%	3.3%	3.8%	4.1%	3.8%	4.2%	4.1%	3.8%	-0.9%
United Kingdom	5.8%	6.1%	5.6%	5.5%	6.5%	7.3%	7.6%	6.6%	6.8%	7.0%	7.4%	1.6%
Other Western Europe	7.0%	7.3%	7.4%	6.4%	9.1%	8.0%	8.6%	9.2%	7.4%	9.6%	7.6%	0.6%
Asian NICs *	2.5%	3.7%	4.8%	4.3%	4.1%	5.2%	5.4%	6.6%	7.6%	7.2%	7.5%	5.0%
EE - U.S.S.R.	6.0%	5.4%	4.9%	4.3%	3.5%	2.7%	3.2%	3.1%	2.6%	2.1%	1.9%	-4.2%
Developing Countries	16.6%	15.6%	13.8%	12.0%	11.2%	10.3%	10.8%	11.7%	11.8%	12.7%	10.7%	-5.9%
Latin America	6.7%	6.3%	4.3%	3.8%	3.4%	3.2%	3.4%	3.6%	4.1%	4.0%	4.2%	-2.5%
Rest of World	0.1%	0.1%	0.0%	0.3%	0.3%	0.4%	0.0%	1.1%	1.2%	1.3%	5.3%	5.2%

Source: CMA World Manufactures Trade Database
* Asian Newly Industrialized Countries = Hong Kong, Taiwan, South Korea, and Singapore

TABLE 11.20
1981 WORLD CHEMICALS TRADE FLOWS (MILLION DOLLARS)
SITC 54 MEDICINAL, PHARMACEUTICAL PRODUCTS

				1981 EXPORTER							
Importer	World	US	Can.	Japan	EC	W Germ	France	U.K.	NICs	L Amer	Other
World	13,320	2,255	163	330	8,053	2,116	1,402	1,663	113	168	2,406
US	668		35	92	346	114	24	53	5	80	190
Canada	278	159		6	66	14	5	28	2	5	45
Japan	1,085	437	12		371	163	48	71	90	16	175
EC	5,484	874	41	82	3,372	803	512	631	12	62	1,103
W Germ	1,140	133	7	25	644		173	100	4	25	327
France	751	198	8	18	414	88		82	0	3	113
U.K.	570	118	4	3	345	114	63		1	6	99
Asian NICs *	310	64	4	55	135	37	12	44	0	0	52
L Amer	936	333	20	24	446	156	71	71	0		113
Other	4,559	388	51	71	3,317	829	730	765	4	5	728

Source: CMA World Manufactures Trade Database

TABLE 11.21
1991 WORLD CHEMICALS TRADE FLOWS (MILLION DOLLARS)
SITC 54 MEDICINAL, PHARMACEUTICAL PRODUCTS

				1991 EXPORTER							
Importer	World	US	Can.	Japan	EC	W Germ	France	U.K.	NICs	L Amer	Other
World	37,704	4,458	231	1,070	22,903	6,309	3,922	4,336	280	279	8,482
US	2,819		114	242	1,578	379	107	523	44	47	794
Canada	967	527		6	278	55	20	104	3	10	142
Japan	2,819	799	2		1,335	732	72	219	46	16	619
EC	17,333	1,887	53	384	10,601	2,372	1,957	2,033	47	134	4,226
W Germ	3,584	310	27	97	1,873		575	363	14	38	1,224
France	2,609	283	3	77	1,580	394		405	2	9	654
U.K.	2,124	214	11	20	1,374	417	303		3	26	477
Asian NICs *	1,237	176	7	192	579	133	78	125	46	2	234
L Amer	1,608	394	17	28	860	211	228	147	4		306
Other	10,921	674	38	218	7,671	2,426	1,460	1,185	91	70	2,161

Source: CMA World Manufactures Trade Database
* Asian Newly Industrialized Countries = Hong Kong, Taiwan, South Korea, and Singapore

TABLE 11.22
COUNTRY SHARES OF WORLD CHEMICAL EXPORTS AND IMPORTS (%)
SITC 54 MEDICINAL AND PHARMACEUTICAL PRODUCTS

Item /Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Share Change 1981-91
Share of World Exports												
U.S.	16.9%	16.3%	18.6%	19.3%	18.1%	16.1%	14.1%	15.1%	13.1%	11.7%	11.8%	-5.1%
Canada	1.2%	1.1%	1.3%	1.2%	1.1%	0.9%	0.9%	0.6%	0.6%	0.6%	0.6%	-0.6%
Japan	2.5%	2.1%	2.5%	2.5%	2.5%	2.6%	2.5%	2.6%	2.8%	2.5%	2.8%	0.3%
EC	58.3%	61.9%	56.6%	56.9%	57.5%	58.0%	59.5%	57.8%	60.9%	60.2%	60.7%	2.4%
To External	35.5%	34.9%	34.1%	34.2%	34.2%	33.7%	33.8%	32.4%	34.2%	32.6%	32.6%	-2.9%
West Germany	15.9%	14.5%	15.3%	15.3%	15.4%	16.4%	17.1%	16.5%	16.6%	16.4%	16.7%	0.8%
France	10.5%	17.6%	10.1%	9.9%	10.0%	10.0%	10.0%	9.5%	10.6%	10.7%	10.4%	-0.1%
Italy	5.2%	4.8%	5.1%	5.3%	5.6%	5.2%	5.0%	4.7%	5.0%	4.3%	4.3%	-0.9%
United Kingdom	12.5%	11.8%	11.7%	11.6%	12.0%	11.2%	11.2%	10.9%	11.6%	11.4%	11.5%	-1.0%
Other Western Europe	16.7%	15.0%	16.5%	15.6%	15.7%	17.5%	18.4%	18.5%	18.5%	21.2%	19.6%	2.9%
Asian NICs *	0.8%	0.5%	0.9%	0.8%	1.1%	1.3%	1.2%	1.4%	0.9%	0.8%	0.7%	-0.1%
EE - U.S.S.R.	0.4%	0.4%	0.4%	0.4%	0.5%	0.6%	0.5%	0.6%	0.4%	0.4%	0.5%	0.1%
Developing Countries	2.5%	2.2%	2.5%	2.6%	2.9%	2.8%	2.5%	3.6%	2.0%	3.4%	2.1%	-0.4%
Latin America	1.3%	1.1%	1.2%	1.3%	1.3%	1.4%	1.2%	1.5%	0.7%	0.6%	0.7%	-0.6%
Rest of World	0.1%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.3%	0.2%	1.0%	0.9%
Share of World Imports												
U.S.	6.8%	6.7%	8.3%	10.3%	10.9%	10.2%	10.2%	11.4%	7.4%	7.0%	7.7%	0.9%
Canada	2.8%	2.9%	3.3%	3.3%	2.7%	2.6%	2.5%	2.3%	2.4%	2.3%	2.5%	-0.4%
Japan	8.5%	8.7%	8.6%	8.6%	8.2%	8.4%	8.6%	9.3%	9.5%	7.8%	7.7%	-0.8%
EC	37.6%	37.0%	37.7%	36.8%	37.2%	39.4%	40.5%	40.1%	43.9%	44.9%	46.8%	9.2%
To External	14.5%	14.4%	14.8%	14.4%	14.3%	15.0%	15.3%	15.2%	16.6%	17.3%	17.9%	3.4%
West Germany	8.7%	8.5%	8.5%	8.4%	8.6%	9.1%	9.2%	8.6%	9.1%	9.3%	10.3%	1.6%
France	5.3%	5.1%	5.2%	4.9%	5.0%	5.2%	5.5%	5.9%	6.9%	7.3%	7.7%	2.4%
Italy	4.8%	4.8%	5.3%	5.5%	6.1%	6.5%	6.5%	6.9%	7.4%	7.7%	7.5%	2.7%
United Kingdom	4.4%	4.8%	5.1%	5.0%	4.8%	4.9%	5.3%	5.3%	5.9%	5.6%	5.9%	1.5%
Other Western Europe	10.3%	10.0%	10.1%	9.8%	10.6%	11.2%	11.8%	10.8%	11.0%	12.1%	10.6%	0.3%
Asian NICs *	2.3%	2.9%	3.0%	3.2%	2.9%	2.9%	2.8%	3.4%	3.5%	3.3%	3.4%	1.1%
EE - U.S.S.R.	1.8%	2.4%	1.7%	1.9%	1.9%	1.8%	1.6%	2.0%	2.2%	3.7%	3.7%	1.9%
Developing Countries	28.9%	28.2%	26.1%	24.7%	24.2%	22.1%	20.3%	18.6%	17.9%	17.5%	14.8%	-14.1%
Latin America	6.9%	6.6%	6.0%	6.2%	6.1%	5.7%	5.2%	4.2%	4.0%	3.8%	4.1%	-2.8%
Rest of World	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.4%	0.4%	0.4%	2.8%	2.8%

Source: CMA World Manufacturers Trade Database
* Asian Newly Industrialized Countries = Hong Kong, Taiwan, South Korea, and Singapore

TABLE 11.23
1981 WORLD CHEMICALS TRADE FLOWS (MILLION DOLLARS)
SITC 58 PLASTIC MATERIALS ETC

				1981 EXPORTER							
Importer	World	US	Can.	Japan	EC	W Germ	France	U.K.	NICs	L Amer	Other
World	24,735	3,758	317	1,906	16,554	5,378	2,243	1,582	250	33	1,950
US	911		153	225	400	151	52	90	85	11	48
Canada	702	604		12	69	23	7	18	11	1	6
Japan	543	287	2		105	50	18	11	115	7	34
EC	12,634	844	36	117	10,453	3,054	1,504	802	12	13	1,172
W Germ	2,918	115	5	32	2,328		487	147	2	5	436
France	2,025	66	2	12	1,824	729		121	1	2	120
U.K.	1,571	152	12	21	1,269	372	207		5	1	112
Asian NICs *	1,104	345	15	531	194	74	28	21	0	0	19
L Amer	1,413	857	32	64	438	184	87	48	0		22
Other	7,428	821	79	957	4,895	1,842	547	592	27	1	649

Source: CMA World Manufactures Trade Database

TABLE 11.24
1991 WORLD CHEMICALS TRADE FLOWS (MILLION DOLLARS)
SITC 58 PLASTIC MATERIALS ETC

				1991 EXPORTER							
Importer	World	US	Can.	Japan	EC	W Germ	France	U.K.	NICs	L Amer	Other
World	71,640	10,404	1,617	4,716	42,365	13,833	5,499	3,843	3,690	515	8,333
US	3,748		1,100	673	1,161	466	153	211	380	208	225
Canada	2,350	2,089		26	171	76	15	42	35	5	25
Japan	1,664	720	9		407	185	59	54	383	10	135
EC	38,751	2,396	83	682	29,388	8,543	4,134	2,351	273	238	5,690
W Germ	9,080	343	16	257	6,639		1,241	574	45	45	1,735
France	6,020	152	7	66	5,222	2,039		453	29	25	518
U.K.	6,007	364	11	81	3,843	1,253	649		39	17	1,652
Asian NICs *	6,392	1,570	121	1,875	855	386	102	106	1,666	39	266
L Amer	2,642	1,952	35	45	546	189	102	62	33		32
Other	16,094	1,678	270	1,415	9,838	3,989	934	1,016	920	14	1,959

Source: CMA World Manufactures Trade Database
* Asian Newly Industrialized Countries = Hong Kong, Taiwan, South Korea, and Singapore

TABLE 11.25
COUNTRY SHARES OF WORLD CHEMICAL EXPORTS AND IMPORTS (%)
SITC 58 PLASTIC MATERIALS

Country/Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Share Change 1981-91
Share of World Exports												
U.S.	15.2%	15.2%	14.4%	14.5%	11.4%	10.3%	10.4%	11.0%	13.4%	13.2%	14.5%	-0.7%
Canada	1.3%	1.4%	1.2%	1.4%	1.7%	1.8%	1.9%	2.5%	2.6%	2.1%	2.3%	1.0%
Japan	7.7%	7.5%	7.9%	8.4%	8.0%	8.0%	7.6%	7.1%	6.7%	6.3%	6.6%	-1.1%
EC	65.0%	64.8%	64.8%	63.4%	65.6%	66.6%	66.7%	64.7%	62.2%	61.7%	59.1%	-5.9%
To External	25.5%	25.1%	25.1%	24.8%	24.9%	23.3%	22.2%	21.4%	20.0%	18.4%	18.1%	-7.4%
West Germany	21.7%	21.4%	21.3%	20.8%	21.5%	22.7%	22.7%	21.6%	20.3%	20.3%	19.3%	-2.4%
France	9.1%	8.4%	8.9%	8.7%	8.8%	8.7%	8.9%	8.8%	8.2%	8.2%	7.7%	-1.4%
Italy	5.9%	6.1%	6.0%	6.1%	6.4%	6.4%	6.4%	6.2%	6.3%	5.2%	5.5%	-0.4%
United Kingdom	6.4%	6.4%	5.8%	5.7%	6.1%	5.8%	5.7%	5.6%	5.5%	5.6%	5.4%	-1.0%
Other Western Europe	7.6%	7.3%	7.5%	7.4%	7.7%	8.0%	8.3%	8.5%	7.4%	8.3%	7.2%	-0.4%
Asian NICs *	1.0%	1.5%	1.5%	1.8%	1.8%	2.0%	2.1%	3.0%	4.5%	4.6%	5.2%	4.2%
EE - U.S.S.R.	1.2%	1.3%	1.2%	1.1%	1.2%	1.0%	0.8%	1.0%	0.8%	1.1%	1.2%	0.0%
Developing Countries	0.6%	0.7%	1.1%	1.6%	2.3%	2.3%	2.1%	2.3%	2.2%	2.9%	1.9%	1.3%
Latin America	0.1%	0.2%	0.5%	0.8%	0.8%	0.8%	0.7%	0.7%	0.8%	0.8%	0.7%	0.6%
Rest of World	0.1%	0.0%	0.1%	0.2%	0.2%	0.2%	0.2%	0.1%	0.2%	0.2%	2.1%	2.0%
Share of World Imports												
U.S.	3.1%	3.1%	4.3%	5.4%	5.6%	5.0%	4.3%	4.2%	5.7%	5.5%	5.5%	2.4%
Canada	3.4%	3.1%	3.9%	4.1%	4.0%	3.5%	3.2%	3.3%	3.5%	3.1%	3.2%	-0.3%
Japan	2.5%	2.6%	2.5%	2.6%	2.5%	2.6%	2.4%	2.6%	2.6%	2.3%	2.5%	0.0%
EC	48.8%	49.4%	49.1%	48.5%	50.5%	53.5%	54.7%	53.7%	52.4%	54.7%	53.4%	4.6%
To External	9.6%	9.6%	9.6%	9.7%	10.3%	10.5%	10.3%	10.3%	10.5%	11.3%	12.9%	3.3%
West Germany	12.0%	12.1%	12.3%	11.9%	12.3%	13.1%	13.0%	12.6%	12.1%	13.1%	13.4%	1.4%
France	8.5%	8.6%	8.1%	7.8%	8.2%	8.9%	9.1%	8.7%	8.6%	9.2%	8.7%	0.2%
Italy	6.5%	6.8%	6.8%	7.2%	7.3%	7.8%	8.1%	7.8%	7.6%	7.7%	7.5%	0.9%
United Kingdom	6.9%	7.3%	7.7%	7.6%	7.8%	7.9%	8.5%	8.9%	8.1%	8.0%	7.4%	0.5%
Other Western Europe	11.4%	11.1%	10.8%	10.3%	11.2%	11.4%	11.4%	11.0%	9.9%	11.1%	9.0%	-2.4%
Asian NICs *	4.4%	4.9%	5.5%	5.6%	4.7%	5.6%	6.6%	6.6%	8.7%	8.1%	9.1%	4.7%
EE - U.S.S.R.	4.1%	3.4%	3.2%	2.9%	3.1%	2.8%	3.0%	3.0%	2.8%	1.9%	2.6%	-1.5%
Developing Countries	20.8%	20.8%	19.3%	18.8%	16.9%	14.4%	13.3%	13.9%	12.6%	12.2%	12.1%	-8.7%
Latin America	5.6%	5.0%	4.4%	4.2%	3.9%	3.6%	3.2%	3.1%	3.5%	3.1%	3.6%	-2.0%
Rest of World	0.2%	0.3%	0.3%	0.3%	0.2%	0.1%	0.1%	0.8%	0.8%	0.9%	2.6%	2.4%

Source: CMA World Manufactures Trade Database
* Asian Newly Industrialized Countries = Hong Kong, Taiwan, South Korea, and Singapore

TABLE 11.26
1981 WORLD CHEMICALS TRADE FLOWS (MILLION DOLLARS)
SITC 59 CHEMICAL MATERIALS NES

				1981 EXPORTER							
Importer	World	US	Can.	Japan	EC	W Germ	France	U.K.	NICs	L Amer	Other
World	16,350	5,257	183	636	8,861	2,834	1,538	1,534	26	124	1,387
US	848		103	112	369	124	45	75	3	71	261
Canada	634	559		7	54	12	4	27	0	1	14
Japan	667	334	5		138	59	12	22	17	3	173
EC	6,226	823	35	69	4,805	1,551	844	641	4	41	490
W Germ	1,031	104	5	23	756		242	86	1	11	142
France	1,159	106	1	6	983	483		128	0	6	63
U.K.	849	134	5	18	585	173	109		1	15	106
Asian NICs *	1,088	770	4	169	129	44	21	39	0	0	16
L Amer	1,422	946	19	30	365	133	72	79	0		62
Other	5,465	1,825	17	249	3,001	911	540	651	2	8	371

Source: CMA World Manufactures Trade Database

TABLE 11.27
1991 WORLD CHEMICALS TRADE FLOWS (MILLION DOLLARS)
SITC 59 CHEMICAL MATERIALS NES

				1991 EXPORTER							
Importer	World	US	Can.	Japan	EC	W Germ	France	U.K.	NICs	L Amer	Other
World	35,795	5,892	321	1,987	21,950	7,120	3,652	3,631	624	269	4,751
US	2,304		244	366	1,175	369	167	282	33	111	376
Canada	1,345	1,167		17	131	43	31	27	3	4	24
Japan	1,791	659	16		554	231	72	82	121	25	416
EC	17,289	1,722	35	302	12,459	3,863	2,160	1,746	55	99	2,617
W Germ	3,637	352	9	97	2,458		732	400	4	33	683
France	3,022	254	2	26	2,374	1,142		319	10	27	329
U.K.	2,462	258	8	47	1,419	485	301	-	7	3	719
Asian NICs *	2,472	507	4	715	742	257	132	135	209	4	291
L Amer	1,715	958	6	43	599	200	117	150	12		96
Other	8,878	879	16	545	6,290	2,156	975	1,208	191	27	931

Source: CMA World Manufactures Trade Database
* Asian Newly Industrialized Countries = Hong Kong, Taiwan, South Korea, and Singapore

TABLE 11.28
COUNTRY SHARES OF WORLD CHEMICAL EXPORTS AND IMPORTS (%)
SITC 59 CHEMICAL MATERIALS NES

Country/Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Share Change 1981-91
Share of World Exports												
U.S.	32.2%	22.7%	21.7%	22.2%	20.1%	17.9%	16.7%	16.5%	15.7%	15.9%	16.5%	-15.7%
Canada	1.1%	1.4%	1.5%	1.4%	1.3%	1.5%	1.4%	0.8%	0.9%	0.9%	0.9%	-0.2%
Japan	3.9%	4.6%	5.3%	5.2%	5.1%	5.2%	5.5%	5.7%	5.7%	5.3%	5.6%	1.7%
EC	53.1%	59.9%	59.8%	58.9%	60.8%	63.4%	63.8%	63.3%	64.2%	63.6%	61.3%	8.2%
To External	25.5%	28.8%	29.4%	29.4%	30.4%	30.1%	29.2%	29.2%	29.5%	27.2%	26.5%	1.0%
West Germany	17.3%	19.3%	20.2%	19.8%	20.2%	22.5%	22.4%	21.3%	21.4%	21.6%	19.9%	2.6%
France	9.4%	9.9%	10.0%	9.8%	9.9%	10.2%	10.2%	9.9%	10.3%	10.4%	10.2%	0.8%
Italy	3.0%	3.5%	3.8%	3.8%	3.7%	3.7%	3.8%	3.8%	3.8%	3.8%	3.8%	0.8%
United Kingdom	9.4%	11.0%	10.3%	10.1%	10.9%	10.4%	10.8%	9.5%	9.5%	9.8%	10.1%	0.7%
Other Western Europe	5.6%	6.4%	6.6%	6.4%	6.8%	6.9%	7.5%	7.1%	6.9%	7.5%	6.9%	1.3%
Asian NICs *	0.2%	0.6%	0.8%	0.9%	1.0%	0.9%	0.9%	1.4%	1.5%	1.6%	1.7%	1.5%
EE - U.S.S.R.	0.4%	0.4%	0.4%	0.4%	0.5%	0.5%	0.5%	0.7%	0.7%	0.8%	0.9%	0.5%
Developing Countries	2.4%	2.3%	2.4%	3.0%	3.2%	2.6%	2.6%	3.2%	3.2%	3.5%	3.2%	0.8%
Latin America	0.8%	0.8%	0.8%	1.2%	1.3%	0.9%	0.8%	1.0%	0.8%	0.8%	0.8%	-0.1%
Rest of World	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.3%	0.3%	0.5%	3.2%	3.2%
Share of World Imports												
U.S.	5.2%	5.5%	5.5%	6.1%	6.8%	6.1%	6.2%	6.2%	5.7%	5.6%	5.5%	0.3%
Canada	3.8%	4.3%	4.6%	4.9%	4.5%	3.8%	3.3%	3.5%	3.9%	3.4%	3.5%	-0.3%
Japan	4.9%	5.4%	5.3%	5.7%	5.5%	5.6%	5.4%	5.6%	5.9%	5.6%	6.1%	1.2%
EC	36.8%	40.9%	41.2%	40.4%	41.5%	44.5%	45.9%	44.5%	44.8%	47.2%	47.4%	10.6%
To External	9.4%	10.2%	10.0%	9.9%	10.5%	10.7%	11.4%	11.3%	11.5%	11.8%	13.5%	4.1%
West Germany	6.5%	7.1%	8.0%	8.0%	8.8%	9.5%	9.5%	8.8%	8.7%	9.6%	10.4%	3.9%
France	7.3%	8.1%	7.7%	7.5%	7.9%	8.6%	8.8%	8.8%	9.3%	9.8%	9.1%	1.8%
Italy	5.3%	5.9%	5.8%	5.7%	5.6%	6.2%	6.8%	6.5%	6.2%	6.1%	6.6%	1.3%
United Kingdom	5.3%	6.0%	5.9%	5.9%	5.9%	5.7%	6.0%	6.0%	6.0%	5.9%	5.8%	0.5%
Other Western Europe	7.2%	8.1%	8.2%	7.5%	8.5%	9.2%	9.4%	9.0%	8.5%	9.8%	7.9%	0.7%
Asian NICs *	6.6%	4.5%	5.0%	5.3%	4.9%	5.2%	5.7%	7.2%	8.8%	8.5%	8.5%	1.9%
EE - U.S.S.R.	4.4%	4.8%	4.3%	4.3%	5.5%	4.9%	4.5%	3.6%	3.2%	2.8%	3.6%	-0.8%
Developing Countries	30.2%	25.4%	25.0%	23.9%	21.1%	19.5%	18.9%	16.8%	15.5%	15.9%	14.9%	-15.3%
Latin America	8.6%	8.0%	7.5%	7.5%	6.8%	6.4%	5.8%	4.8%	4.5%	4.1%	4.6%	-4.1%
Rest of World	0.2%	0.3%	0.3%	0.7%	0.6%	0.5%	0.3%	2.9%	2.8%	1.1%	2.7%	2.5%

Source: CMA World Manufactures Trade Database
* Asian Newly Industrialized Countries = Hong Kong, Taiwan, South Korea, and Singapore

Definition of the Chemical Industry

There is no single definition of the chemical industry for statistical purposes. Data in this handbook are cited on the basis on which they were published. To the greatest extent possible, data herein cover the Chemicals and Allied Products industry as Standard Industry Code (SIC) 28, as detailed in OMB's *Standard Industrial Classification Manual*. SIC 28 includes both establishments producing basic chemicals and establishments manufacturing products by predominantly chemical processes. Establishments classified in this major group manufacture three general classes of products: (1) basic chemicals, such as acids, alkalies, salts, and organic chemicals; (2) chemical products to be used in further manufacture, such as synthetic fibers, plastic materials, dry colors, and pigments; and (3) finished chemical products to be used for ultimate consumption, such as drugs, cosmetics, and soaps; or to be used as materials or supplies in other industries, such as paints fertilizers, and explosives.

Data on R&D funding, new plant & equipment expenditures, and finances of the industry, however, are reported on a company basis which differs in concept from data reported on an industry basis. Data reported on a company basis may include non-chemicals business activities by companies classified as chemical companies. For example, the new plant and equipment expenditure data collected by the Bureau of the Census will include investments by chemical companies for non-chemical assets and hence may overstate capital investment by the chemical industry. On the other hand, these data will not capture investments in chemical plants made by companies classified in other industries because their other activities are larger than their chemical business. For this reason, the gross investment data developed by the Bureau of Economic Analysis may be preferable in that it includes investments only for chemical assets but reflects these investments by both chemical and non-chemical companies.

CM

printed on recycled paper